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ABSTRACT

These self-study materials are a basic course for Marines working as mechanics. The course contains three study units. The first unit explains mechanics' hand tools and their proper care and usage. The second unit introduces the duties of the personnel at a basic level, describes the areas of a typical shop, and deals with shop operations and equipment. The third unit covers shop safety and firefighting procedures and explains the purposes and background of the different guidelines found in a typical shop. Each of the three study units begins with a general objective, which is a statement of what the student should learn from the unit. The study units are divided into numbered work units, each presenting one or more specific objectives. Text is illustrated as needed for each work unit. At the end of the work units are study questions, with answers listed at the end of the study unit. A review lesson completes the course. (KC)

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13.30
9 Nov 84

1. ORIGIN

MCI course 13.30, Basic Shop Fundamentals for the Mechanic, has been prepared by the Marine Corps Institute.

2. APPLICABILITY

This course is for instructional purposes only.

J. M. D. HOLLADAY
Lieutenant Colonel, U. S. Marine Corps
Deputy Director

ACKNOWLEDGMENT

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INFORMATION

FOR

MCI STUDENTS

Welcome to the Marine Corps Institute training program. Your interest in self-improvement and increased professional competence is commendable.

Information is provided below to assist you in completing the course. Please read this guidance before proceeding with your studies.

1. MATERIALS

Check your course materials. You should have all the materials listed in the "Course Introduction." In addition you should have an envelope to mail your review lesson back to MCI for grading unless your review lesson answer sheet is of the self-mailing type. If your answer sheet is the pre-printed type, check to see that your name, rank, and social security number are correct. Check closely, your MCI records are kept on a computer and any discrepancy in the above information may cause your subsequent activity to go unrecorded. You may correct the information directly on the answer sheet. If you did not receive all your materials, notify your training NCO. If you are not attached to a Marine Corps unit, request them through the Hotline (autovon 288-4175 or commercial 202-433-4175).

2. LESSON SUBMISSION

The self-graded exercises contained in your course are not to be returned to MCI. Only the completed review lesson answer sheet should be mailed to MCI. The answer sheet is to be completed and mailed only after you have finished all of the study units in the course booklet. The review lesson has been designed to prepare you for the final examination.

It is important that you provide the required information at the bottom of your review lesson answer sheet if it does not have your name and address printed on it. In courses in which the work is submitted on blank paper or printed forms, identify each sheet in the following manner:

DOE, John J. Sgt 332-11-9999
08.4g, Forward Observation
Review Lesson
Military or office address
(RUC number, if available)

Submit your review lesson on the answer sheet and/or forms provided. Complete all blocks and follow the directions on the answer sheet for mailing. Otherwise, your answer sheet may be delayed or lost. If you have to interrupt your studies for any reason and find that you cannot complete your course in one year, you may request a single six month extension by contacting your training NCO, at least one month prior to your course completion deadline date. If you are not attached to a Marine Corps unit you may make this request by letter. Your commanding officer is notified monthly of your status through the monthly Unit Activity Report. In the event of difficulty, contact your training NCO or MCI immediately.

3. MAIL-TIME DELAY

Presented below are the mail-time delays that you may experience between the mailing of your review lesson and its return to you.

	TURNAROUND MAIL TIME	MCI PROCESSING TIME	TOTAL NUMBER DAYS
EAST COAST	16	5	21
WEST COAST	16	5	21
FPO NEW YORK	18	5	23
FPO SAN FRANCISCO	22	5	27

You may also experience a short delay in receiving your final examination due to administrative screening required at MCI.

4. GRADING SYSTEM

LESSONS			EXAMS	
GRADE	PERCENT	MEANING	GRADE	PERCENT
A	94-100	EXCELLENT	A	94-100
B	86-93	ABOVE AVERAGE	B	86-93
C	78-85	AVERAGE	C	78-85
D	70-77	BELOW AVERAGE	D	65-77
NL	BELOW 70	FAILING	F	BELOW 65

You will receive a percentage grade for your review lesson and for the final examination. A review lesson which receives a score below 70 is given a grade of NL (no lesson). It must be resubmitted and PASSED before you will receive an examination. The grade attained on the final exam is your course grade, unless you fail your first exam. Those who fail their first exam will be sent an alternate exam in which the highest grade possible is 65%. Failure of the alternate will result in failure of the course.

5. FINAL EXAMINATION

ACTIVE DUTY PERSONNEL: When you pass your REVIEW LESSON, your examination will be mailed automatically to your commanding officer. The administration of MCI final examinations must be supervised by a commissioned or warrant officer or a staff NCO.

OTHER PERSONNEL: Your examination may be administered and supervised by your supervisor.

6. COMPLETION CERTIFICATE

The completion certificate will be mailed to your commanding officer and your official records will be updated automatically. For non Marines, your completion certificate is mailed to your supervisor.

7. RESERVE RETIREMENT CREDITS

Reserve retirement credits are awarded to inactive duty personnel only. Credits awarded for each course are listed in the "Course Introduction." Credits are only awarded upon successful completion of the course. Reserve retirement credits are not awarded for MCI study performed during drill periods if credits are also awarded for drill attendance.

8. DISENROLLMENT

Only your commanding officer can request your disenrollment from an MCI course. However, an automatic disenrollment occurs if the course is not completed (including the final exam) by the time you reach the CCD (course completion deadline) or the ACCD (adjusted course completion deadline) date. This action will adversely affect the unit's completion rate.

9. ASSISTANCE

Consult your training NCO if you have questions concerning course content. Should he/she be unable to assist you, MCI is ready to help you whenever you need it. Please use the Student Course Content Assistance Request Form (ISD-1) attached to the end of your course booklet or call one of the AUTOVON telephone numbers listed below for the appropriate course writer section.

PERSONNEL/ADMINISTRATION	288-3259
COMMUNICATIONS/ELECTRONICS/AVIATION	
NBC/INTELLIGENCE	288-3604
INFANTRY	288-3611
ENGINEER/MOTOR TRANSPORT	288-2275
SUPPLY/FOOD SERVICES/FISCAL	288-2285
TANKS/ARTILLERY/INFANTRY WEAPONS REPAIR	
LOGISTICS/EMBARKATION/MAINTENANCE MANAGEMENT/	
ASSAULT AMPHIBIAN VEHICLES	288-2290

For administrative problems use the UAR or call the MCI HOTLINE: 288-4175.

For commercial phone lines, use area code 202 and prefix 433 instead of 288.

BASIC SHOP FUNDAMENTALS FOR THE MECHANIC

Course Introduction

BASIC SHOP FUNDAMENTALS FOR THE MECHANIC is a basic course for Marines working as mechanics. This course is mainly for Private through Lance Corporal although it may help Marines in the Non-Commissioned Officer ranks. The course itself explains the mechanics tools and their proper care and usage. It explains the duties of the shop personnel at a basic level and describes the areas of a typical shop while realizing that not two shops are alike. The coverage of Shop Safety and Fire Fighting Procedures explains the purposes and background of the different guidelines found in a typical shop. This course also serves as a basic course that will support the mechanic in taking other mechanics courses from the Marine Corps Institute, regardless of field.

ADMINISTRATIVE INFORMATION

ORDER OF STUDIES

Study Unit	Study	Subject Matter
1	3	Care and Use of Handtools
2	3	Shop Procedures
3	2	Shop Safety Procedures
	2	REVIEW LESSON
	2	FINAL EXAMINATION
	2	
	12	

RESERVE RETIREMENT CREDITS:	4
EXAMINATION:	Supervised final examination without textbook or notes; time limit, 2 hours.
MATERIALS:	MCI 13.30, Basic Shop Fundamentals for the Mechanic. Review lesson and answer sheet.
RETURN OF MATERIALS:	Students who successfully complete this course are permitted to keep the course materials.

SOURCE MATERIALS

NAVPERS 10085-B	Tools and Their Uses, 1971
TM 9-243	Use and Care Of Handtools and Measuring Tools, Sep 1960
SL-3-00456A w/ch 1-7	Tool Kit, Mechanics, General, DEC 1971
UM-4790-5	Users Manual, Oct 1981

HOW TO TAKE THIS COURSE

This course contains three study units. Each study unit begins with a general objective that is a statement of what you should learn from the study unit. The study units are divided into numbered work units, each presenting one or more specific objectives. Read the objective(s) and then the work unit text. At the end of the work unit text are study questions that you should be able to answer without referring to the text of the work unit. After answering the question, check your answers against the correct ones listed at the end of the study unit. If you miss any of the questions, you should restudy the text of the work until you understand the correct responses. When you have mastered one study unit, move on to the next. After you have completed all study units, complete the review lesson and take it to your training officer or NCO for mailing to MCI. MCI will mail the final examination to your training officer or NCO when you pass the review lesson.

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MARINE CORPS INSTITUTE

STUDY GUIDE

Welcome to the Marine Corps Institute correspondence training program. By enrolling in this course, you have shown a desire to improve the skills you need for effective job performance, and MCI has provided materials to help you achieve your goal. Now all you need is to develop your own method for using these materials to best advantage.

The following guidelines present a four-part approach to completing your MCI course successfully:

1. Make a "reconnaissance" of your materials;
2. Plan your study time and choose a good study environment;
3. Study thoroughly and systematically;
4. Prepare for the final exam.

I. MAKE A "RECONNAISSANCE" OF YOUR MATERIALS

Begin with a look at the course introduction page. Read the COURSE INTRODUCTION to get the "big picture" of the course. Then read the MATERIALS section near the bottom of the page to find out which text(s) and study aids you should have received with the course. If any of the listed materials are missing, see Information for MCI Students to find out how to get them. If you have everything that is listed, you are ready to "reconnoiter" your MCI course.

Read through the table(s) of contents of your text(s). Note the various subjects covered in the course and the order in which they are taught. Leaf through the text(s) and look at the illustrations. Read a few work unit questions to get an idea of the types that are asked. If MCI provides other study aids, such as a slide rule or a plotting board, familiarize yourself with them. Now, get down to specifics!

II. PLAN YOUR STUDY TIME AND CHOOSE A GOOD STUDY ENVIRONMENT

From looking over the course materials, you should have some idea of how much study you will need to complete this course. But "some idea" is not enough. You need to work up a personal study plan: the following steps should give you some help.

(A) Get a calendar and mark those days of the week when you have time free for study. Two study periods per week, each lasting 1 to 3 hours, are suggested for completing the minimum two study units required each month by MCI. Of course, work and other schedules are not the same for everyone. The important thing is that you schedule a regular time for study on the same days of each week.

(B) Read the course introduction page again. The section marked ORDER OF STUDIES tells you the number of study units in the course and the approximate number of study hours you will need to complete each study unit. Plug these study hours into your schedule. For example, if you set aside two 2-hour study periods each week and the ORDER OF STUDIES estimates 2 study hours for your first study unit, you could easily schedule and complete the first study unit in one study period. On your calendar you would mark "Study Unit 1" on the

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appropriate day. Suppose that the second study unit of your course requires 3 study hours. In that case, you would divide the study unit in half and work on each half during a separate study period. You would mark your calendar accordingly. Indicate on your calendar exactly when you plan to work on each study unit for the entire course. Do not forget to schedule one or two study periods to prepare for the final exam.

(C) Stick to your schedule.

Besides planning your study time, you should also choose a study environment that is right for you. Most people need a quiet place for study, like a library or a reading lounge; other people study better where there is background music; still others prefer to study out-of-doors. You must choose your study environment carefully so that it fits your individual needs.

III. STUDY THOROUGHLY AND SYSTEMATICALLY

Armed with a workable schedule and situated in a good study environment you are now ready to attack your course study unit by study unit. To begin, turn to the first page of study unit 1. On this page you will find the study unit objective, a statement of what you should be able to do after completing the study unit.

DO NOT begin by reading the work unit questions and flipping through the text for answers. If you do so, you will prepare to fail, not pass, the final exam. Instead, proceed as follows:

(A) Read the objective for the first work unit and then read the work unit text carefully. Make notes on the ideas you feel are important.

(B) Without referring to the text, answer the questions at the end of the work unit.

(C) Check your answers against the correct ones listed at the end of the study unit.

(D) If you miss any of the questions, restudy the work unit until you understand the correct response.

(E) Go on to the next work unit and repeat steps (A) through (D) until you have completed all the work units in the study unit.

Follow the same procedure for each study unit of the course. If you have problems with the text or work unit questions that you cannot solve on your own, ask your section OIC or NCOIC for help. If he cannot aid you, request assistance from MCI on the Student Course Content Assistance Request included with this course.

When you have finished all the study units, complete the course review lesson. Try to answer each question without the aid of reference materials. However, if you do not know an answer, look it up. When you have finished the lesson, take it to your training officer or NCO for mailing to MCI. MCI will grade it and send you a feedback sheet listing course references for any questions that you miss.

IV. PREPARE FOR THE FINAL EXAM

How do you prepare for the final exam? Follow these four steps:

(A) Review each study unit objective as a summary of what was taught in the course.

(B) Reread all portions of the text that you found particularly difficult.

(C) Review all the work unit questions, paying special attention to those you missed the first time around.

(D) Study the course review lesson, paying particular attention to the questions you missed.

If you follow these simple steps, you should do well on the final. GOOD LUCK!

STUDY UNIT 1

CARE AND USE OF HANDTOOLS

STUDY UNIT OBJECTIVE: WITHOUT THE AID OF REFERENCES, YOU WILL IDENTIFY THE TOOLS CONTAINED WITHIN THE GENERAL MECHANICS TOOL KIT. YOU WILL ALSO IDENTIFY THEIR CARE AND MANY USES. IN ADDITION, YOU WILL IDENTIFY THE USE OF THE COMPONENT LISTING FOR INVENTORIES OF TOOLS.

Work Unit 1-1. THE GENERAL MECHANICS TOOL KIT

IDENTIFY THE GENERAL MECHANICS TOOL KIT.

STATE ONE SECURITY REQUIREMENT FOR THE GENERAL MECHANICS TOOL KIT.

DESCRIBE THE MOST IMPORTANT TOOLS OF THE MECHANIC.

STATE THE PURPOSE OF CLEAN TOOLS.

You, the mechanic, are responsible for performing the maintenance necessary for keeping the equipment of your unit in high state of readiness. When you are sick, you report to sickbay where you are treated by a doctor. When equipment is not working properly, it is sent to the maintenance shop for repairs or adjustments. Here you, the mechanic, do the "doctoring."

When you report to the shop for duty, you either will be issued or have access to a General Mechanics Tool Kit. This kit will have nearly all the tools you will need as a mechanic. You will re required to maintain these tools, by keeping them clean and serviceable. A padlock is furnished with each tool kit for security of the tools. Each lock has two keys; one key should be kept in a sealed envelope and stored in the company safe, supply office, or the shop office. This will provide a replacement key in case you lose the other key which is entrusted to you.

This kit is the basic tool kit for the mechanic. It is found in all equipment shops, and is usually stored in the tool room. The main thing to remember, however, is that the most important tool that you have in your posession is a set of hands. Without your hands, no tool kit in the Marine Corps can help you. Along these lines, your eyes, ears, and feet are also hard to replace. You must remember that in any shop, one important rule is to use common sense. This will save you a lot of grief, because most accidents are caused by carelessness - not taking the time to think.

After you have the tool kit, inspect your tools. Are they broken, dirty, worn, or chipped? If they are you have a job to do. Clean tools are the mark of a good mechanic. When you use them, they are bound to get dirty, but when you are done with them, clean them. Dirty tools can slip or slip from your grip and your hands will suffer. A clean tool will fit the work properly and provide you with an easier task.

The major problem with a tool kit is loosing tools. Lost tools can cost you money if you have to replace them. More than that, if your don't have particular tool in your kit, you are bound to need it, and then what do you do? Face it, you have to know every tool, and after you have used it, put it back in the box.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. When you report to a shop for duty, you will have access to or be issued a

   a. tool box.
   b. General Purpose Repair Kit.
   c. General Mechanics Tool Kit.
   d. Intermediate Tool Kit.

2. The tool kit is secured with a padlock with two keys; one is kept by the mechanic and the other is _____.

3. The most important tools of the mechanic are _____.

4. What is the purpose of clean tools? _____
   _____.

Work Unit 1-2. CARE AND USE OF SCREWDRIVERS

IDENTIFY THREE PARTS OF A SCREWDRIVER.

IDENTIFY TWO TYPES OF SCREWDRIVER TIPS.

IDENTIFY THE FACTORS WHICH PROVIDE FOR PROPER FIT OF A SCREWDRIVER.

IDENTIFY PROPER MAINTENANCE OF THE FLAT TIP SCREWDRIVER.

A screwdriver is one of the most basic handtools. It has the widest use and takes the hardest abuse. It is designed for one purpose only, to drive or remove screws. The screwdriver should NOT be used as a pry bar, a scraper, a chisel or a punch.

The screwdriver has three main features (fig 1-1). The portion you grip is called the handle. The steel portion extending from the handle is called the shank. The end which fits into the screw is called the blade. The steel shank is designed to with stand considerable twisting force. The shank may be square in order to accommodate the use of a wrench. This is the only screwdriver on which you should use a wrench.

Fig 1-1. Common Screwdriver.

Standard screwdrivers are classified by the length of the shank and blade. The most common sizes range from 2 inches to 12 inches. There are also many screwdrivers of larger and smaller sizes that are generally designed for special purposes. The diameter of the shank, and the width and thickness of the blade are generally proportionate to the length.

Screwdriver handles are generally wood or plastic; however, some are metal with wooden inserts. The shank may extend all the through the handle or may be only half way through, and pinned in the handle.

When using a screwdriver, it is important to select the proper size so that the blade fits the screw slot properly. This prevents burring the slot and reduces the force required to hold the driver in the slot. You should keep the shank perpendicular to the screw head (fig 1-2).

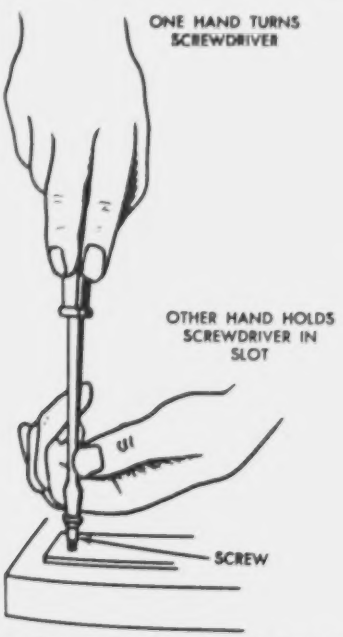


Fig 1-2. Proper Positioning of screwdriver.

In general, the above covers most screwdrivers. The flat tip screwdriver, also called the common screwdriver, has a round steel blade, forged from steel alloy and tempered from strength. The proper fit and use of the flat tip have been explained.

The phillips screwdriver has a cross tip (fig 1-3) and fits screws that have a slot for this tip. It comes in four different sizes, that vary from sizes 1 to 4 and fits screws with the same sizes. The tip itself has a four way slot, 30-degrees flukes, and a blunt end. These two screwdrivers will handle 90 percent or more of the work that would require the use of a screwdriver. The rest of the work can be handled by the offset screwdriver (fig 1-4).

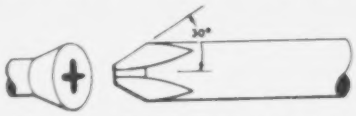


Fig 1-3. Screwdriver and screw.

The offset is used where there is not sufficient vertical space for a flat tip or a phillips. It is forged with one end having a blade in line and the other end having a blade at right angles. Both ends are bent 90 degrees to the shank handle. By alternating ends, most screws can be tightened or loosened even when the work area is restricted. Each tool kit contains one of these in a configuration as shown in figure 1-4.

Fig 1-4. Offset Screwdriver.

When you are using a screwdriver, you should use the longest screwdriver possible which is still convenient for the work. This allows you to use more torque, making the job easier.

The width of the tip should equal the length of the screw slot and the tip should be thick enough to fit the width of the screw slot (fig 1-5). Hold the handle firmly in one hand with the head of the handle against the palm and grasp the shank and guide it into the screw slot with the other hand. The screwdriver should be in line with the axis of the screw. To drive the screw in, press down and turn the screwdriver clockwise (to the right).

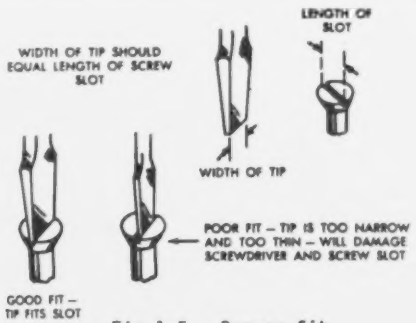

LENGTH OF SLOT
WIDTH OF TIP SHOULD EQUAL LENGTH OF SCREW SLOT
WIDTH OF TIP
POOR FIT – TIP IS TOO NARROW AND TOO THIN – WILL DAMAGE SCREWDRIVER AND SCREW SLOT
GOOD FIT – TIP FITS SLOT

Fig 1-5. Proper fit.

When moving your hand to take a new grip, hold the screwdriver firmly with the other hand. When working in a restricted area, it may become necessary to remove the screwdriver and turn it with your hand. To remove a screw, the operation is the same, but the direction is reversed. If the screw is not coming out, try to tighten it and then loosen it. This action can free the screw from rust or paint and still allow you the reuse the screw at a later date. If a tight screw with a damaged slot can be backed out partically, it then may be removed using pliers. It is important to clean the slot before removing the screw. If the slot is dirty, the screwdriver will have an improper fit.

When a screwdriver becomes nicked, or the edges become rounded or when other damage occurs that renders the screwdriver useless, it must be reground or filed. If using a file, place the screwdriver in a vise. Tighten the vise to grasp the shank firmly. When using a grinder, adjust the tool rest to hold the screwdriver against the wheel at the desired angle. Either way, you should not grind away any more material then is absolutely necessary. After squaring the tip, file or grind the sides until you reach the desired thickness (fig 1-6-1-8).

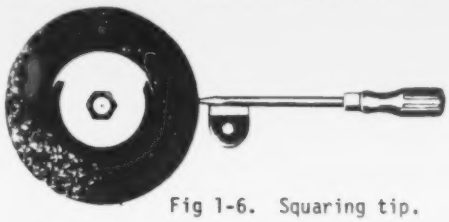


Fig 1-6. Squaring tip.

If you are grinding, dip the screwdriver in water frequently to preserve the temper. If the blade discolors, the temper is damaged and the tool will lack strength. Retempering can be done by reheating about 1 1/2 inches of the shank to a cherry red color and immediately dipping about 3/4 inch of the blade in clean cold water. The shine can be restored by quickly rubbing the hardened end in an aluminum abrasive. The color will creep back into the blade. When it is a light blue color, redip the blade in the cold water. When this process is complete, the screwdriver has regained its temper.

Fig 1-7. Grinding sides.

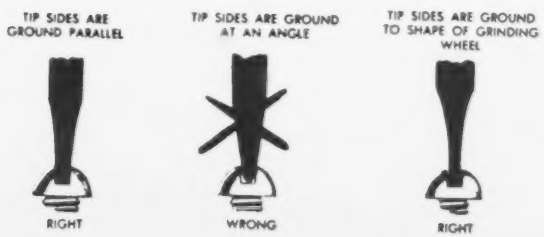

TIP SIDES ARE GROUND PARALLEL
TIP SIDES ARE GROUND AT AN ANGLE
TIP SIDES ARE GROUND TO SHAPE OF GRINDING WHEEL
RIGHT
WRONG
RIGHT

Fig 1-8. Right shape.

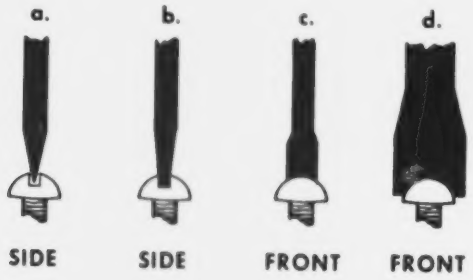
When working with the screwdriver, make the extra effort to keep it clean. Before you store the screwdriver in your toolbox, wipe it clean. You may want to apply a light coat of oil or silicone to prevent rust. Above all, treat the tool with respect and it will last as long as you need it.

EXERCISE: Answer the following questions and check you responses against those listed at the end this study unit.

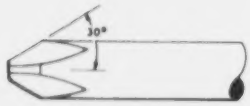
1. The three main parts of a screwdriver are the

   a. face, edge, and tip.
   b. blade, handle, and shank.
   c. tip, face, and shank.
   d. handle, shank, and edge.

2. Which of the illustrations below shows the proper fit of a screwdriver?



3. The tip shown in the illustration below is a



a. phillips tip.
b. reed and prince cross tip.
c. phillips flat tip.
d. common tipped.

4. If the flat tip screwdriver blade is chipped, you should

a. retemper it.
b. grind the shank.
c. grind the sides and square the end.
d. grind the ends and shank.

5. The screwdriver can be strengthened through a process known as

a. tempering.
b. dressing.
c. squaring.
d. grinding.

Work Unit 1-3. CARE AND USE OF HAMMERS

IDENTIFY TWO TYPES OF HAMMERS.

IDENTIFY WHEN A HAMMER IS UNSERVICEABLE.

The general mechanics tool kit contains two types of hammers. These are the machinists ball peen hammer and the inserted plastic face hammer. Figure 1-9 shows the ball peen. This hammer is broken down into five parts as shown. The handle that is found in the tool kit is generally plastic. The ball peen of the hammer is smaller than the striking face. This allows the ball peen to be used in striking areas that are too small for the face to strike. Ball peen hammers are classed according to the weight of the head without the handle. The classes in the tool kit are four and eight ounces, and one pound.

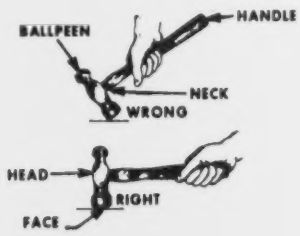


Fig 1-9. The ball peen hammer.

Four and eight ounces hammers are often used to perform light work and cut gaskets out of sheet gasket material. This gasket cutting is an ideal use for the ballpeen end as light tapping will cut bolt holes without causing damages merely by placing the material over the piece needing the gasket. The concave and convex surfaces can be done the same while exercising care not to damage the working surfaces. When you are using the face of the hammer, you should try not to hit the working surface at an angle as this can damage not only the hammer but also the surface of the work. The one-pound hammer is used for heavier work but can be used to do the same job with proper control. The use of this hammer should not include cutting gaskets unless it is necessary because it is difficult to limit the force of the strike of the face.

Fig 1-10. Plastic face hammer.

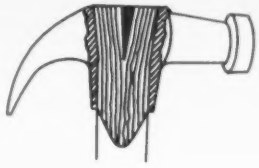


Fig 1-11. Putting in wedges.

The hammer with an inserted plastic face is also known as a soft faced hammer (fig 1-10). It is used when there is some danger of damaging the surface of the work. The heads of this hammer are usually removeable, so when the faces become damaged, they can be removed easily. The tool kit rates one hammer with a head weight of one-half pound. Not all hammers will have the same faces on them as they are available in soft, medium, heavy, nylon, or rubber. You must be careful with these hammers as they tend to rebound more than a regular hammer.

Handles on the hammer often become damaged. When one is cracked, splintered, or loose, it is time to change the handle. A wooden handle is easier to change than the fiberglass handle. You remove the wedge from the opening in the top of the head and pound out the wornout handle. Insert the new handle from the bottom to a tight fit in the head. Remove any excess wood sticking out the top and pound the wedge in even with the surface of the handle (fig 1-11). After checking for fit, the hammer is repaired. The fiberglass handle is put into place with epoxy; however, most shops will try to replace the hammer instead of trying to replace the handle. The handle is hard to remove. It can be heated and pounded out with the head firmly held in a vise. This is a lengthy process, yet it can be done. After removing the handle, a fiberglass handle can be installed in the same manner as earlier explained. A new fiberglass handle can be installed only if you have the right kind of epoxy or resin on hand. The handle is inserted in the head in the same manner as the wooden one. At the base of the head a filler or plug material must be used to prevent the epoxy from draining through. Epoxy should cover the handle in the top of the head and pool in the opening. It should be left in this position for at least 24 hours before checking it for use.

Incorrect or abusive use of the hammer frequently results in uneven face wear. Faces also wear after considerable use and must be restored.

Examine the face of the hammer and determine if the face should be flat or rounded by comparing it with an unworn tool of the same type. File or grind the face to the proper shape. Dip the head in water frequently to prevent damage to the tempering. Try not to remove any more material than is absolutely necessary. Small chips and nicks can be removed in the same manner; now ever, when large chips are found or the head is cracked, the hammer is unserviceable and should be replaced.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The machinists ball peen hammer is contained in the General Mechanics Tool Kit in the ____and____ounces sizes.

   a. 4,12
   b. 4,8
   c. 8,12
   d. 10,14

2. When you are hammering on a surface that may be damaged, you should

   a. wrap the ball peen in a rag.
   b. use a small ball peen hammer.
   c. use the hammer handle.
   d. use the plastic faced hammer.

3. Which of the following describes an unserviceable hammer?

   a. Small chips on the face of a ball peen
   b. Side of ball peen have scratches
   c. Face of hammer is flat
   d. Head of hammer has large chips and is cracked

Work Unit 1-4. THE CARE AND USE OF PLIERS

IDENTIFY THE TYPES OF PLIERS.

IDENTIFY THE PROPER USE OF THE PLIERS.

When you are using pliers, it is proper to tighten or loosen nuts because it is more convenient than looking for a wrench -- right or wrong? Wrong! Pliers will strip a nut quicker than anything. So what a good are they? Pliers have two basic functions: gripping and cutting.

The gripping pliers in the tool kit are battery pliers, slip-joint pliers (straight nose and angle nose), hose, clamp pliers, and brake repair pliers.

Fig 1-12. Battery terminal pliers.

Battery terminal pliers (fig 1-12) are made to use only on the terminal clamps on the battery. An ideal set of these pliers is made from an alloy that is non-conductive to electrical current thereby eliminating the chance of damage from an electrical short. It is used to apply removing pressure on the soft lead terminal nuts. You must ensure that you are exerting force that does not cause bending or damage to the post.

Fig 1-13. Slip joint pliers.

Slip joint pliers (fig 1-13) are pliers with straight, serrated (grooved) jaws. The pivot point that connects the two parts of the pliers has two positions. This allows the pliers to grip small or large sized objects better. To relocate the positioning, open the pliers to the widest position and move each side of the pliers either together or apart. The grooved jaws should not be used on hardened steel as this will tend to damage the flukes of the groove. At the point where the jaws come together, a wire cutting ability is built in. You merely place the wire as far back as possible and squeeze the handles of the pliers together. This cutter is designed to cut softer metals such as nails or wire. It is not designed to cut hardened metals such as rivets or spring wire.

This type of pliers is found in your tool box in two different styles. One is described above and the other is called a multi-tongue or channel lock. These pliers have an angle nose and can be set at several jaw openings instead of just two. These pliers, however, should not used to cut any metal unless they have a cutter, most do not. They are positioned in the same manner as the normal slip joint, but can be spread to a wider jaw opening. You should remember that the wider the jaw is opened, the more care you have to use.

Fig. 1-14. Channel-lock pliers.

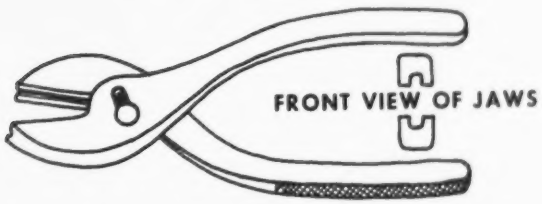


Fig 1-15. Hose clamp pliers.

Hose clamp pliers (fig 1-15) have a groove that runs the length of each jaw opening. This groove will fit the wire spring type hose clamp, allowing you to exert pressure closing the pliers handles on the clamp. This action releases pressure on the hose and the clamp can be backed down the hose. These pliers should not be used to grip sheet metal as they will simply slide off the work.

The cutting pliers consist of the long round cutter or needle nose and the diagonal cutter.

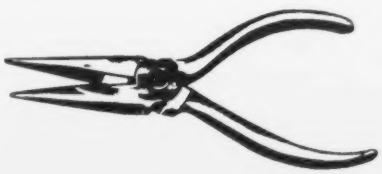


Fig. 1-16. Side cutting long nose pliers.

The needle nose pliers (fig 1-16) have jaws that can grip items in a small area and have a straight, pointed, serrated jaw. They have a built-in cutting area that is perfect for cutting wire or stripping the insulation from wire. The needle nose pliers can be readily used for installation and removal of cotter pins. They can also be used to cut, bend, and twist safety wire. Extra care must be used with these pliers since they are easily broken or chipped. Once they are chipped or the end of a jaw is broken off, they are practically useless.

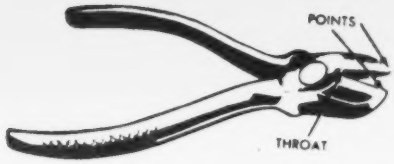


Fig 1-17. Diagonal cutting - 6 inch.

Diagonal pliers (fig 1-17) are used for cutting small, lightweight materials, such as wire and cotter pins in areas inaccessible to larger cutting tools. Since they are designed only for cutting, they will cut objects larger than the slip joint pliers can handle. The diagonal edges are offset 15 degrees and designed to cut objects flush. The jaws are cutting edges and should never be used to grip objects.

Fig 1-18. Brake spring pliers.

Brake spring pliers (fig 1-18) grip yet are a tool that has only one real function used to spread and put springs in place. To look at it, you may see very little need for this ugly contraption. It is not so difficult to use, but try spreading the springs without one of these!

Pliers must be maintained properly. You can dress the cutting edges of the diagonal cutter when it becomes dull. Remember, never remove any more material than is absolutely necessary. Dress both jaws the same amount so the pliers will close properly. Grooves of the slip joint pliers must be kept sharp. These grooves can be maintained by using a three-sided pliers file. If the jaws of the pliers do not open far enough to permit filing or grinding, remove the pivot pin or screw. The pliers should be cleaned after use, ensuring that the grooves are cleaned of all dirt or metal. The pliers should be stored with a light coat of oil.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Which of the illustrations below identifies battery terminal pliers?

a. b. c. d.

2. Which of the illustrations below identifies cutting pliers?

a. b. c. d.

3. Two types of slip joint pliers are in the General Mechanics Tool Kit. These are the_____and_____.

4. The pliers that have a groove that runs the length of each jaw are the

   a. channel-locks.
   b. battery terminal.
   c. long nose.
   d. hose clamp.

5. The pliers designed to cut objects flush are the

   a. long nose.
   b. diagonal.
   c. needle nose.
   d. brake.

6. The grooves in slip joint pliers can be kept sharp by

   a. using the pliers to grip only soft metals or plastics.
   b. keeping the grooves cleaned.
   c. using a three-sided file.
   d. sanding with light sandpaper across the groove tips.

Work Unit 1-5. CARE AND USE OF WRENCHES

IDENTIFY THE WRENCHES.

EXPLAIN WHEN AN ADJUSTABLE END WRENCH IS USED.

IDENTIFY THE SOCKET HEAD WRENCH.

IDENTIFY WHEN TO USE THE PIPE WRENCH.

A wrench is a basic tool that is used to exert a twisting force on bolt heads, nuts, studs, and pipes. The wrench may have a different design, but you should remember that the basic function is the same.

The size of the wrench is based on the size of the bolt heads or nuts for which it was designed. A one-inch wrench will have a one-inch jaw opening that is five to eight thousandths of an inch larger. This clearance allows the wrench to slide on and off the appliance with a minimum of play. If the wrench is too large, the points of the nut or bolt head will be rounded and destroyed.

The General Mechanics Tool Kit contains the following wrenches: open-end, box-end, combination, adjustable, socket head, pipe, and pliers.

The open-end wrench (fig 1-9) has exactly that, an open end on each end of the handle. The tool kit has these wrenches ranging in size from 3/8 to 3/4 inch. There are four wrenches with two sizes on each wrench. The 3/8 inch is merged with the next common size of 7/16 inch and so on, up to the 3/4 inch. The jaw openings are generally at a 15-degree angle when compared to the straight handle. Some may be open a few degrees more. This is not just for appearance. It is handy when you are working in tight quarters and have to turn the wrench over to continue to loosen or tighten a nut. This maneuver, known as flopping (fig 1-20), would not be possible if the handle was straight. When the wrench is flopped over, it will two flat edges, allowing you to turn it more (fig 1-20).

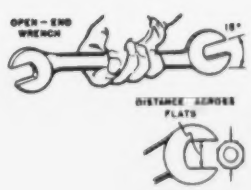


Fig 1-19. Open-end wrenches.

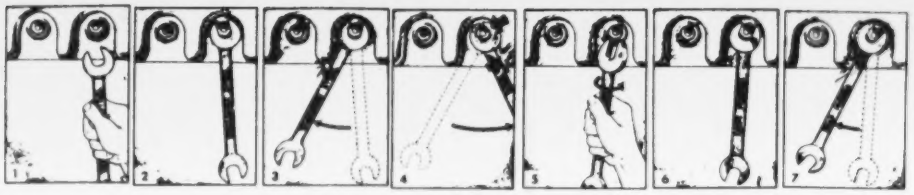


Fig 1-20. Use of open-end wrench, flopping.

1. Wrench, with opening sloping to the left, about to be placed on nut.
2. Wrench positioned and ready to tighten nut. Note that space for swinging the wrench is limited.
3. Wrench has been moved clockwise to tighten the nut and now strikes the casting which prevents further movement.
4. Wrench is removed from nut and turned counter clockwise to be placed on the next set of flats on nut. But corner of casting prevents wrench from fitting onto the nut.
5. Wrench is being flopped over so that wrench opening will slope to the right.
6. In this flopped position, the wrench will fit the next two flats on the nut.
7. Wrench now is pulled clockwise to further tighten nut until wrench again strikes casting, by repeating the flopping procedures, the nut can be turned it is tight.

Fig 1-21. 12 Point box-end wrench

Box-end wrenches (fig 1-21) conform to the shape of the nut or bolt. They do not have jaws like the open-end wrench, but they have a complete circle on the ends of the handle. Inside this circle, there are 12 points that will allow for the tight fit needed. The advantage of the 12 point configuration is that the wrench will have a thin wall which is more suitable for turning nuts that are hard to get at with an open end wrench. Another advantage is that this wrench will operate between obstructions where the handle swing is limited.

The tool kit contains box-end wrenches in the same basic design as the open-end wrench. A different size on each end, again starting with 3/8 - 7/16 inch and ending with 3/4 inch . However, the kit contains only the three wrenches and six sizes used the most.

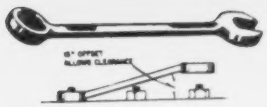


Fig 1-22. Combination wrench.

The combination wrench (fig 1-22) is designed to make the best of the open-end and the box-end on one handle. Both ends are the same size. This allows you to break the nut free and merely switch the end of the wrench for rapid work. In combination wrench has the box-end offset at a 15-degree angle to provide a better clearance for the work.

The tool kit contains a set of combination wrenches graduated in size from 5/16 to 1 inch. As mentioned earlier, these wrenches are 12-point design with the offset end.

When you use these wrenches, ensure that the fit is correct (fig 1-23). If you have to pull hard on the wrench as in loosening a nut, make sure the wrench is seated squarely on the flats of the nut. Remember, pull on the wrench--DO NOT PUSH. Pushing the wrench is a good way to injure your hands if the wrench slips or the nut breaks loose unexpectedly. If it is impossible to pull the wrench, and you must push, do it with the palm of your hand and hold your palm open.

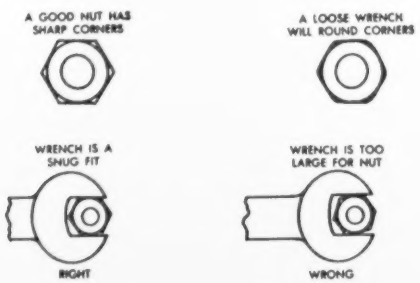


Fig 1-23. Proper fit of wrench.

Practice will tell you if you are using the right amount of force on the wrench. The best way to tighten a nut is to turn it until the wrench has a firm, solid feel. This will turn the nut to proper tightness without stripping the threads or twisting off the bolt. This feel is developed by experience alone.

Your tool kit contains two handy adjustable end wrenches also called cresent wrenches. These wrenches are not intended to take the place of the regular open-end wrench. They are also not designed for hard to turn items. Their usefulness is achieved by being capable of fitting odd-sized nuts. This flexibility is achieved by being capable of moving one jaw along a warner screw slide (fig 1-24). By turning this thumbscrew, the lower jaw is moved up and down to fit the odd-sized nut.

Fig 1-24. Adjustable wrench.

These wrenches are often misused and abused. When you are doing some work, ensure that the nut is odd-sized. After you do this, adjust the lower jaw to a firm fit on the flats of the nut. The nut should be positioned as deep in the throat of the wrench as possible. Then pull the wrench toward the side of the adjustable jaw (fig 1-25). This will prevent the adjustable jaw from springing open and slipping off the nut. If you cannot do all of the above, you should recheck the size and, if possible, select another wrench. Because the jaw is located only at one end, you may be tempted to slide a pipe over the other end of the wrench for increased leverage (fig 1-26). This is a dangerous practice because its exerts, much more force on the wrench than for which it was designed. Usually, when too much force is applied to this type of wrench, the thumbscrew will either strip out or break. It is simply not a good idea to use a tool for anything other than what is was designed.

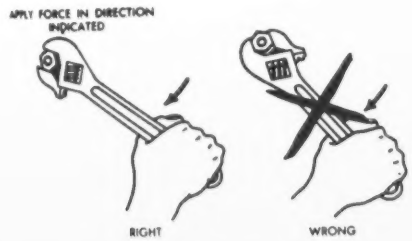


Fig 1-25. Proper use of adjustable wrench.

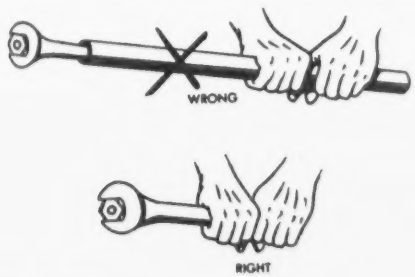


Fig 1-26. Improper use of wrench.

The socket wrench is one of the most versatile wrenches in your tool box. Basically, it consists of a handle and a socket type wrench which can be attached to the handle. Your tool box contains three sets (fig 1-28) of these wrenches. The size of each set is based on the size of the square end of the handle that fits into the socket. The three sizes are 1/4, 3/8, and 1/2 inch. The socket has a square opening cut into one end to fit the square lug located on the handle. In the other end of the socket is a 12-point opening very mujch like the opening of the box-end wrench. The size of the 12-point opening will be engraved or stamped on the side of the socket.

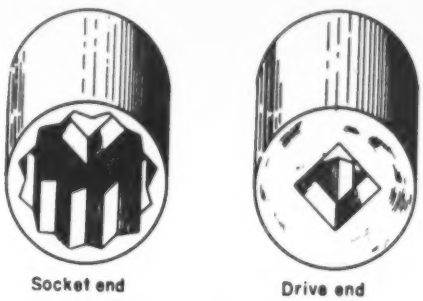


Fig 1-27. Socket wrenches.

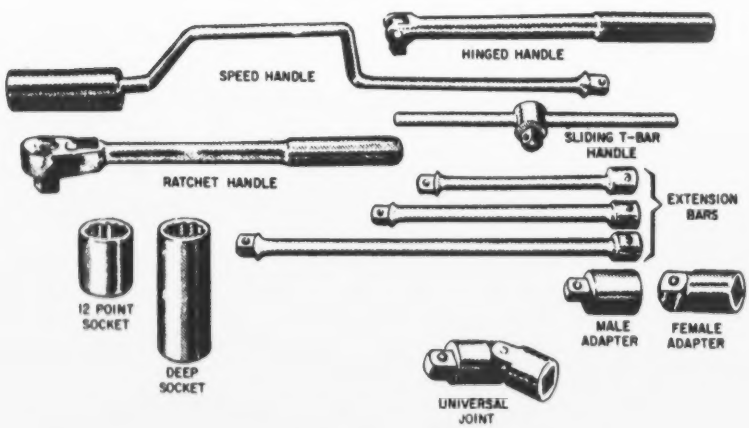


Fig 1-28. Typical socket wrench set.

The handles used for the socket include the ratchet, hinged (breaker), speed or brace, and sliding T-bar. The ratchet handle (fig 1-29) has a reversing lever which operates a pawl (dog or gear) inside the head of the tool. Pulling the handle in one direction will cause the pawl to engage the ratchet teeth and turn the socket in one direction.

Fig 1-29. Ratchet handle.

Moving the handle in the opposite direction will cause the pawl to slide over the ratchet teeth, permitting the handle to backup without removing the socket. This allows rapid turning of the nut or bolt after each partial turn of the handle. With the reversing lever in one position, the handle can be used for tightening. In the other position, the handle can be used for loosening. Often too much pressure applied may cause the mechanism within the head to break; however, this is usually caused by using the head of the wrench like a hammer.

Fig 1-30. Hinged handle.

The hinged handle is also very convenient . To loosen tight nuts, swing the handle at right angles to the socket. This gives the greatest possible leverage. After loosening the nut to the point where it turns easily, move the handle to the vertical position and then turn the handle with your fingers. Since this is not a ratchet type, you must lift the socket off the work and get a new position when turning the socket. The hinged part of the handle is susceptible to twisting and breaking when used in an improper manner such as with a "cheater" pipe.

Fig 1-31. Sliding T-Bar handle.

The sliding T-bar (fig 1-31.) handle has a sliding lug along a bar, but the lug cannot be removed from the bar. The head can be positioned anywhere along the bar. You need only to select the positioned that is convenient for the work. Because of the short length of the bar, this handle can not be used when a lot of force needs to be exerted.

Fig 1-32. Speed handle.

The speed handle or brace works like the woodworkers brace drill. After the nuts are loosened with the sliding T-bar or the ratchet, the speed handle can be used to quickly remove the nuts. In many instances, the speed handle is not strong enough to break free or firmly tighten the nut. The speed socket must be used carefully to avoid damage to the bolt threads. It should be used so that it turns on its own axis instead of being overly out of line.

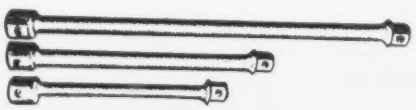


Fig 1-33. Extension bars.

In the sets there are six extension bars (fig 1-33) that vary in length from 3 to 10 inches long. The bar has a square lug on one end to fit the socket and on the other end it has a square lug opening to accommodate the handle. These extension bars are solid but there are also two extensions with a hinge in the middle. These are called universal joints (fig 1-34) and are use when the nut is off center to the handle. The universal is capable of applying pressure to the nut regardless of the position of the handle.

Fig 1-34. Universal joint.

There are two crowfoot attachments (fig 1-35.) that allow the socket to turn a nut in the manner of the open end wrench. These are found in 1/2 and 9/16 inch sizes with the 3/8 -inch drive.

Fig 1-35. Crowfoot socket.

The socket itself comes in two sizes. There is the common size (fig 1-36) and the deep well (fig 1-37). The deep well is handy for work such as spark plugs or when the bolt protrudes through the nut too far to use the standard socket.

Your socket sets should be kept clean. When a socket has been subjected to too much stress, it will crack or mar. Once this has happend, the socket must be replaced. It is usually unwise to try to repair the socket since it has lost the ability to fit firmly on the work to be accomplished. When you inspect your sets, ensure that the lugs on the handles and extensions are not bent and that the hinges are still in good working order. When they are stored, a light coat of oil will preserve the shine on them.

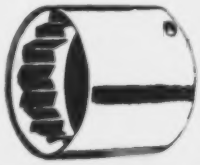


Fig 1-36. Common socket, 12 point.

Fig 1-37. Deep socket 12-point.

The pipe wrench or stillson wrench (fig 1-38) is used when rotating or holding round work. The moveable jaw on the pipe wrench is pivoted to permit a gripping action on the work. This tool must be used with discretion as the jaws are serrated and will always make marks on the work unless adequate precautions are observed. This means that areas such as brass fittings and hydraulic cylinder plungers will be scarred and probably will be damaged beyond reuse. The jaws should be adjusted so that the bite is taken at about the center of the jaws. The pipe wrench should never be used on nuts. The tool kit has a fourteen-inch pipe wrench with a jaw opening of 1/2 to 1 1/2 inches. This jaw size limits the uses of the wrench, but it still is a very useful tool. Since the tool will rust readily, apply touch up paint and a light coat of oil to it when it is stored in the tool box.

Fig 1-38. Adjustable pipe wrench.

The plier wrench or vise grips (fig 1-39) is a tool that is a cross between the pliers and the pipe wrench. It can used for holding objects, regardless of their shape. A screw adjustment in one of the handles makes them suitable for several different sizes. The other handle has a release mechanism. When using the vise grips, adjust for a firm fit on the object being held. When you close the handles, the vise grips locks in place on the work.

Fig 1-39. Vise grips.

This allows the mechanic to leave the work clamped while he proceeds to another project. When you are done with the tool, depress the tongue on the inside of the release handle and it will snap open. The vise grips has a serrated jaw that also may mar the working surface if it is not used carefully. When the tool is adjusted to open too far the screw will come free, allowing the pliers to come apart. If this happens, you should remount the lever that has come free and return the screw to a tighter position. If the work is this big, you may want to use the pipe wrench since to will open to a larger size. Remember that when the jaw is clamped shut, the jaws opening also shrinks and tightens on the work. use a light coat of oil and a drop of oil at the joints when putting this tool back into the box. Above all else, keep the tool clean.

The serrated jaws on the pipe wrench and the vise grips can be maintained with the three-sided file. It is easier if you clamp your tool in a vise when you do this.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

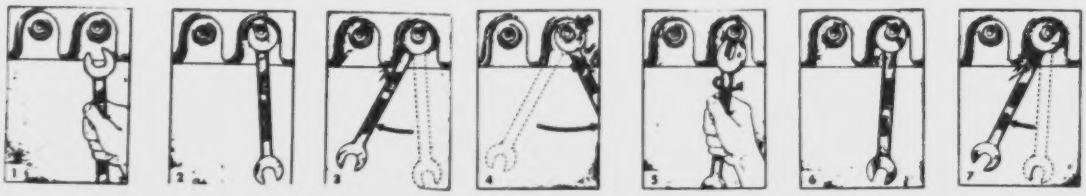
1. The wrench is a basic tool that exerts a_____force.

   a. circular
   b. twisting
   c. maximum
   d. combined

2. Wrench manufacturers allow a clearance of_____thousandths of an inch in the jaws of the bench.

   a. 5 to 8
   b. 8
   c. 25 to 50
   d. 100

3. The illustration below demonstrates a manuver with the open end wrench known as



   a. transferring.
   b. flipping.
   c. flopping.
   d. flooring.

4. The box-end wrench has_____point ends.

   a. 6
   b. 10
   c. 12
   d. 24

5. The adjustable end wrench is used when_____.

6. The General Mechanics Tool Kit has three sizes of drive ends. These are 1/4, 3/8, and _____inch.

   a. 1/2
   b. 5/8
   c. 3/4
   d. 1

7. When you slide a pipe over the end of a wrench, you have

   a. a tool that can do more.
   b. applied the use of torque in your wrench.
   c. created a safe tool for hard to turn parts.
   d. initiated an unsafe practice that may break the tool.

Given a list of socket wrench tools and various illustrations, match the name of the tool in column 1 to the illustration in column 2. Place your answers in the spaces provided.

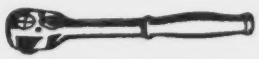
Column 1	Tool
___ 8.	Brace
___ 9.	Hinged handle
___ 10.	Universal
___ 11.	Deep well
___ 12.	Crowfoot
___ 13.	Sliding T-bar

Column 2

Illustration

a.

b.



c.

d.

e.

f.

g.

h.

14. The pipe wrench should not be used on

    a. brass.
    b. black pipe.
    c. galvanized metal pipe.
    d. steel pipe.

15. The tool that has the dual actions of a pliers and a pipe wrench is the

    a. socket wrench.
    b. vise grips.
    c. brace.
    d. stillson.

Work Unit 1-6. CARE AND USE OF PUNCHES AND CHISELS

DESCRIBE THE DIFFERENCE BETWEEN A CHISEL AND A PUNCH.

EXPLAIN THE PROPER DRESSING OF TIPS AND HEADS.

EXPLAIN HOW THE SIZE IS DETERMINED ON THE CHISEL.

Chisels and punches are found in the General Mechanics Tool Kit. Both are made to be struck by the hammer, but their uses differ in respect to the work to be accomplished. The chisel is designed to chip or cut any metal that is softer than the metal the chisel is made from. The punch is designed to perforate or punch any metal that is softer than the punch.

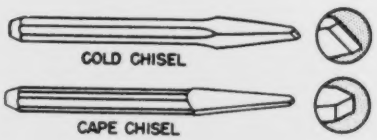


Fig 1-40. Chisels.

Chisels (fig 1-40) are made from a good grade of tool steel and have a hardened cutting edge and beveled head. Cold chisels are classified according to the shape of their points; the width of the cutting edge denotes their size. The tool kit contains two types of chisels, the cold and the cape chisel. The cold chisels are 1/2 and 3/4-inch size. The cape chisel is the 3/8-inch size. Cold chisels are used for cutting rivets, (fig 1-41) splitting nuts, and cutting grooves and square corners in thin metal.

As with other tools, there is a correct technique for using a chisel. Select the chisel that is right for the job. Be sure to use a hammer that matches the chisel. That is, the larger the chisel, the heavier the hammer. A heavy chisel will absorb the blows of a light hammer and do virtually no cutting.

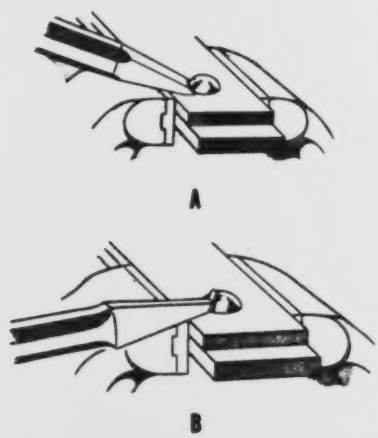


Fig 1-41. Cutting off a rivet head with a chisel.

As a general rule, hold the chisel in your left hand with your thumb and finger about one inch from the top. It should be held steady, but not too tightly. Keep your eyes on the cutting edge of the chisel, and not on the head, and swing the hammer on the same plane as the chisel. If you have alot of chiseling to do, you may consider sliding a length of rubber hose over the handle portion of the chisel. This will serve to absorb some of the shock while allowing you to continue to work. You should wear goggles or eye protection when doing any chiseling. If other Marines are working close by, you may want to erect some sort of screen to protect them from flying metal. Remember, the time to take precautions is before you commence the job.

A punch (fig 1-42) is a tool that is held in the hand and struck on one end with a hammer. The tool kit contains two kinds of punches: the center punch and the drive pin punch. These punches are made from tool steel. The part held in your hand is usually octagonal shaped, or it may be knurled. This prevents the tool from slipping around in your hand.

Fig 1-42. Punches.

There are two things to remember when you use a punch. First: when you hit the punch, you do not want it to slip sideways over your work. Second: you do not want the hammer to slip sideways and strike your fingers. You can eliminate both these troubles by holding the punch at right angles to the work and striking the punch squarely with the hammer.

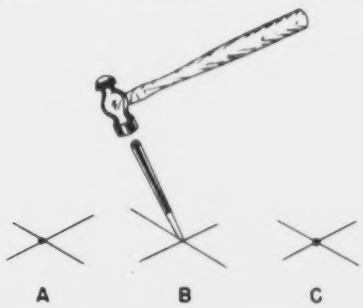


Fig 1-43. Marking the intersections of lines with a center punch.

The center punch, as the name implies, is used for marking the center of a hole to be drilled. If you try to drill a hole without punching the center, the drill will "wander" or "walk away" from the desired center. Another use of the center punch is to make corresponding marks on two pieces of an assembly to permit reassembly in the original position. Before you take the assembly apart, you would make two corresponding marks on the object, either side of where it comes apart. To do this, refer to figure 1-44. The marks are staggered from one side to the other to ensure proper reassembly. Your first step is to draw a line across the joint and either single punch or double punch a long the line, to eliminate possible errors. In reassembly, refer to the punch marks and attempt to match the lines exactly. When making the punch mark, usually you need only tap lightly and the mark should be clear enough.

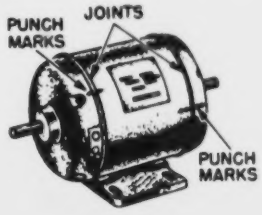


Fig 1-45. Punching mating parts of a mechanism.

You don't want to mark off center on the line. If you examine the line and find you are off slightly, you can realine the punch and strike a little harder, causing a larger mark, distinguishing it from the smaller wrongly placed mark.

The pin punch is used to remove pins and cotter pins from their mounting when they have deteriorated or become rusty. The kit contains a tapered pin punch, which you would use to break the pin free. When this is done, you should select a punch that fits the work to drive the pin all the way out. Always use the largest pin that will fit the hole. These other pin punches have a straight tip and are in the 1/8, 1/4, and 3/8-inch tip size while the tapered tip size is 1/8 inch. The edges of these punches are flat and never pointed or rounded.

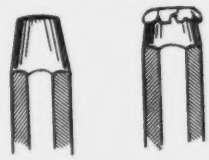


Fig 1-45. Good and bad shaped chisel heads.

At times, you can remove a tight nut using the point punch, if all else has failed. This is done by using a punch that is smaller in diameter than the work that you are doing. You should not attempt to hit the side of the work, but hit the top squarely with the punch and hammer. This may loosen the nut enough to enable you to use a wrench. You should not use the straight pin punches as aligning tools as the tips can bend or break easily when used improperly.

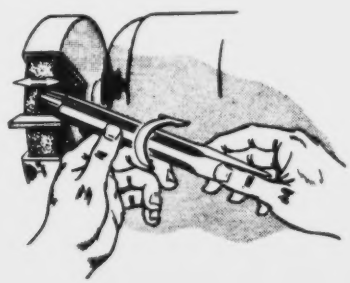


Fig 1-46. Grinding a chisel head with a bench grinder.

If the heads on your chisels and punches have chipped or mushroomed (fig 1-45) they should be filed or ground down to their original shape much like you would do with other tools (fig 1-46). The top is beveled, so the chisel and punch should have bevels on all sides and should not have a flat head. If the tip of the pin punch is broken off, it should also be replaced. When the tool is damaged too severely, it is generally better to replace it with a new tool. If you elect to renew the tip, ensure that you do not lose the tempered qualities of the tip. Remember to dip it in water frequently, and if you grind the tip of the cold chisel, remember that the tip is slightly convexed. As a general rule, keep the tool clean and coat it with a light coat of oil.

EXERCISE: Answer the following questions and check your responses against those listed at the end this study unit.

1. The General Mechanics Tool Kit contains two types of chisels: the cold and the _____chisels.

   a. hot
   b. 1 pound
   c. round
   d. cape

2. The chisel is designed for chipping or cutting, while the punch is designed to_____.

3. There are two punches contained in the kit. The center and _____punches.

   a. prick
   b. pin
   c. pole
   d. pulled

4. The chisel and the punch will become worn on the head after frequent usage, a condition known as

   a. worming.
   b. dressing.
   c. mushrooming.
   d. toadstooling.

5. When the head of the punch or chisel needs to be dressed, you should_____.

6. The chisel and punch size is determined by_____.

Work Unit 1-7. CARE AND USE OF FILES

IDENTIFY THE CLASSIFICATION OF FILES.

DEFINE THE CROSSFILING.

DEFINE DRAWFILING.

DEFINE FILING ROUND STOCK.

A tool kit in any shop in the Marine Corps is not complete unless it contains an assortment of files. In the General Mechanics Tool Kit, you have three files, identified by their shapes (fig 1-47). You have an 8-inch round file, a ten-inch flat file, and a 6-inch triangular file.

Fig 1-47. Cross-sectional shapes of files.

Files come in different shapes to enable you to use them in many different ways. A file has five different parts as shown in figure 1-48. The tang is the end used for the handle. The heel is an area devoid of teeth that enables you to have a handrest. The edge and the face are working surfaces and the point is the end of the working surface.

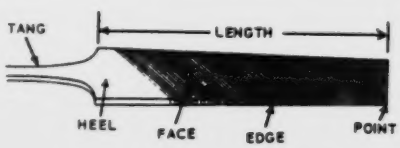


Fig 1-48. File nomenclature.

Files are graded according to the degree of fineness and whether they have single or double-cut teeth (fig 1-49). Single-cut files are used for sharpening tools, finish filing, and draw filing. They are ideal for smoothing the edges of sheet metal. Files with criss-crossed rows of teeth are double-cut files (fig 1-50). The double cut forms teeth that are diamond shaped and fast cutting. You should use the double-cut file for quick removal of metal, and for rough work. The files in the tool kit are all of this type, but also have either one side single-cut as in the flat file, or edges single cut as on the triangular file.

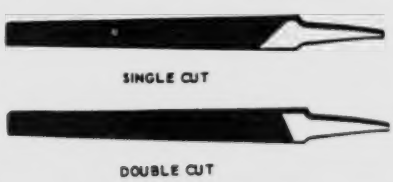


Fig 1-49. Single and double-cut files.

Triangular or three-square files (fig 1-51) are tapered on all three sides (longitudinally). They are used to file acute inner angles, and to clear out square corners.

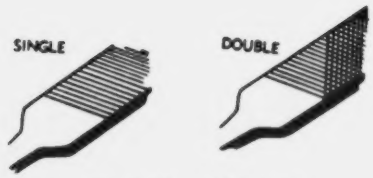


Fig 1-50. File cut.

Flat files (fig 1-52) are general purpose files. They are tapered in width and thickness, but their edges are parallel.

Round or rat tail files (fig 1-53) are made to fit openings such as bolt holes. They are used to make the opening larger to prevent pinching of a bolt.

Fig 1-51. Triangular three sided.

Fig 1-52. Flat.

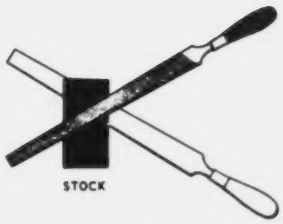
Fig 1-53. Round.

When you are using a file, you must use it properly. There are basically three methods of filing: crossfiling, drawfiling, and filing round metal stock (fig 1-54).

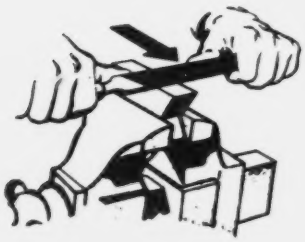
Crossfiling is shown is figure 1-54A. The file is moved across the surface of the work in approximately a cross wise direction. For best results, you file with slow, full length, steady strokes. The file cuts as you push it, while easing up on the return strokes. You may alternate your position as shown in figure 1-54B. This will ensure that you have hit the entire piece of metal. Once you have gone in both directions, you will be able to see high and low spots. You can readily check the flatness of the work with a straight edge.

Drawfiling is shown in figure 1-54C. Drawfiling produces a finer surface finish and usually a flatter surface than crossfiling. Small parts are best held in a vise when being filed. Hold the file as shown in the figure notice that the arrow indicating the cutting stroke is away from you when the handle of the file is held in the right hand. The cutting stroke reverses when you use the handle in your left hand. Remember to lift the file on the return stroke.

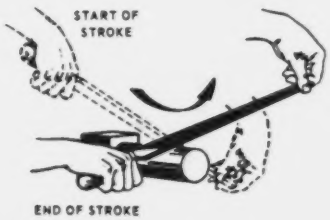
A. CROSSFILING A PIECE OF MILD STEEL



B. ALTERNATING POSITIONS WHEN FILING



C. DRAWFILING A SMALL PART



D. FILING ROUND METAL STOCK

Fig 1-54. Filing operations.

Filing round stock is shown in figure 1-54D. As a file is passed over the round work surface, it must have a rocking motion, or the surface will flatten out slightly. This motion will allow the file to do a better job, plus it will serve to keep the file cleaner.

The file should not be used as a punch or prybar as it will break. Always use the file handle to prevent injury. Once the file breaks, it should be replaced. When you file, be firm but do not apply too much pressure or you will break the file.

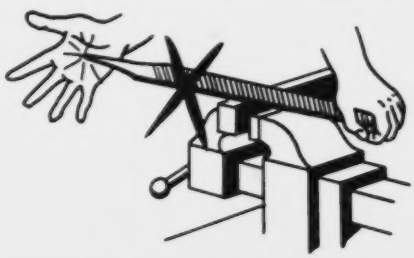


Fig 1-55. Use handle.

A new file should be broken in carefully by using it first on brass, bronze, or smooth cast iron. Just a few of the teeth will cut at first, but it will smooth out after the teeth are all used. This will clean off any burrs or coating from the manufacturer. Protect your file from water or moisture. Try to keep oil from your file as it will cause your file to tend to slide across work. Files that you keep in your toolbox should be wrapped in a clean dry rag or paper. A file should be kept clean using a file card, which is like a brush (fig 1-56). If you do not have a file card, you may use a firm brush. You should brush down the teeth from the sides on the single-cut or use swift strokes on the double-cut.

Fig 1-56. Use of file cleaner card.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. In the General Mechanics Tool Kit, there are three files, classified by their

   a. fineness.
   b. cut.
   c. length.
   d. shape.

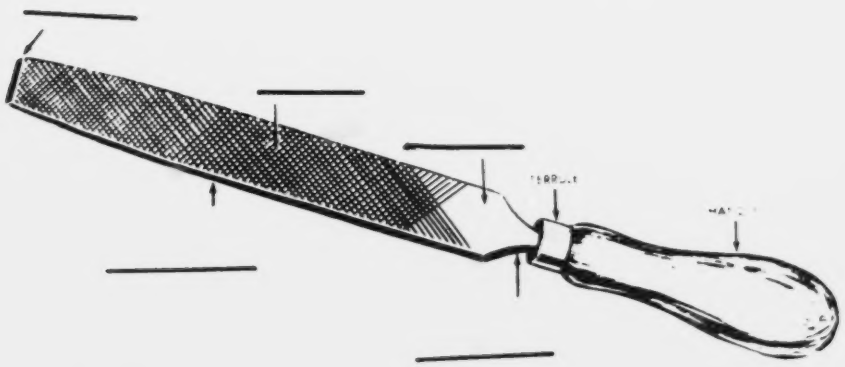
Define the following terms:

2. Crossfiling_____

3. Drawfiling_____

4. Filing round stock_____

5. In the illustration below, fill in the blank that identifies the five parts of the file.



Work Unit 1-8. CARE AND USE OF MEASURING TOOLS

IDENTIFY WHEN TO USE THE TAPE MEASURE.

IDENTIFY ONE USE OF THE FEELER GAGE.

You have three measuring tools in your tool kit. These are the machinist's steel rule, measuring tape, and the thickness or feeler gages. At anytime, these tools are very handy for measuring the lengths of bolts, parts, gaskets, and precise clearances.

The machinists steel rule (fig 1-57) is a six-inch ruler made form tempered tool steel. It is broken down into segments of 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, and 1-inch measurements. Although it is slightly flexible, it should not used to bend around a part for measurement because this will damage the straight line edge.

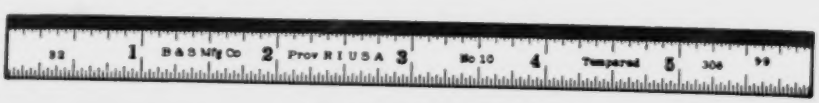


Fig 1-57. Steel rule.

The tape measure (fig 1-58) is 72-inch long, compact, rolled within a small case, and a ruler. It is broken down into segments of 1/32, 1/16, 1/8, 1/4, 1/2, and 1-inch intervals. It is flexible and has a hook on the end of the tape that can be put over the edge of an object to hold it firmly while you are measuring. It is a push-pull rewind type which means that you have to push the tape back into the case to reroll it. This tape is flexible and can be bent around objects for easier, accurate measurements (fig 1-59).

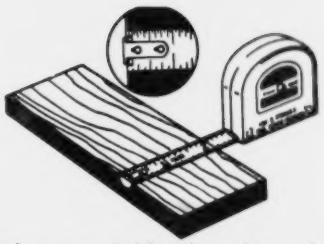


Fig 1-58. Measuring an outside dimension using a tape rule.

Thickness or feeler gages (fig 1-60) are used for checking and measuring small openings, such as slots or machine clearances. The tool kit has two sets of feeler gages, each mounted in its own handle. One gage measures from .010 to .035 with the use of 17 blades. The other gage has 26 blades and measures between .0015 and .025 These blades can be used together to measure a higher amount by merely adding the thickness of each blade. If the desired clearance is .045, you round the .035 and the .010 to achieve the .045. The blades of these sets are likely to bend or scratch because of improper use. Do not push them into too small a slot. When not using the gages, close them and put them away.

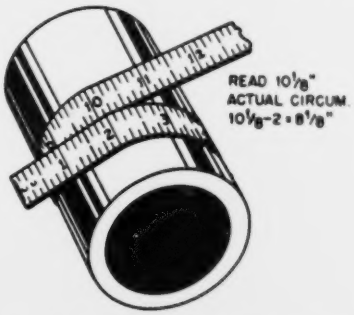


Fig 1-59. Measuring the circumference of a pipe with a tape.

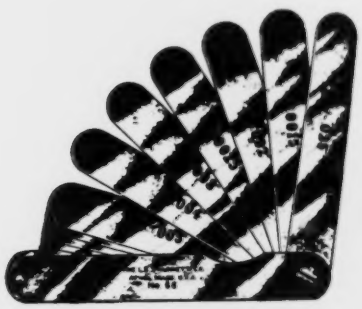


Fig 1-60. Thickness gages.

EXERCISE: Answer the following questions and check your response against those listed at the end of this study unit.

1. The measuring tool that can be used to measure circumference is the

   a. 6 inch rule.
   b. tape measure.
   c. feeler gage.
   d. thickness gage.

2. Thickness or feeler gages are used for measuring

   a. bolts.
   b. circumference.
   c. large slots.
   d. machine clearances.

Work Unit 1-9. USE OF BATTERY TOOLS

IDENTIFY THE USES OF TWO BATTERY TOOLS.

There are two main battery tools in the tool kit. These are the pliers for battery terminal removal or the battery terminal puller, and the terminal clamp spreader.

The pliers are used to remove the terminal from the battery post. This in done only after the nuts holding the clamp have been loosened. The bottom jaw of the pliers is like a two-prong fork, and the top jaw is a plunger. When the handles are squeezed together, the forks lift on the terminal and, at the same time, the plunger pushes down on the battery post. The terminal should come off easily, but sometimes it does not. When using the pliers, it is important not to twist or pull on the terminal. You may damage the terminal as it is made of lead and is very soft.

Fig 1-61. Terminal puller.

If the terminal still will not come off, you should use the battery terminal puller (fig 1-61). This tool has arms that hook on two sides of the terminal and a screw type plunger that pushes on the battery post. The basic principle of the pliers and the puller is the same. You must ensure that the bits of the two arms is good, and then tighten the "T" handle in a clockwise direction. This action forces the terminal off the post. This puller can also be used for small gears, but you should remember that it was not designed for this. When you used it in this manner, you may damage the handle from too much stress. The General Mechanics tool Kits may have have or the other but should have the battery terminal puller as a replacement item.

Once the terminal has been removed from the battery, you should use the battery terminal spreader on it. This tool is actually a pliers with a plunger shaped end at a right angle to the handles. The plunger end is separated in the middle. When the handles are pressed together, this plunger will separate forcing the inside of the terminal to spread. You should spread the terminal only enough to enable you to fully mount it on the post. The outside of the plunger end is serrated for a good reason. This is the reamer for the inside of the terminal. You turn the tool back and forth in the terminal to clean the corrosion out. This will allow for better electrical contact. On the handle there is located a metal cup-shaped device that is used to clean the battery post. Here, also, the tool is turned back and forth to clean and shape the post.

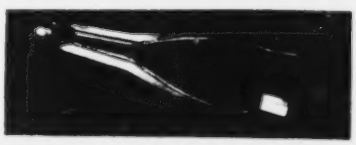


Fig 1-62. Terminal spreader.

These tools should be kept clean and the serrated edge of the terminal spreader may be dressed as necessary. A light coat of oil should be applied to the terminal puller when it is stored. The other tools are made of an aluminum alloy so a drop of oil should be sufficient on the joint of the handles.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

Given a list of three battery tools and a list of their functions, match the tool in column 1 to its function in column 2. Place your answers in the spaces provided.

Column 1	Column 2
Battery tools	Functions
____ 1. Battery pliers	a. Loosens the terminal from the battery
____ 2. Terminal Puller	b. Increases the size of terminal opening
____ 3. Terminal clamp spreader	c. Loosens the nuts on the battery terminal

Work Unit 1-10. USE OF COMPONENT TOOL KITS

IDENTIFY TWO COMPONENTS KITS WITHIN THE GENERAL MECHANICS TOOL KIT.

The tool kit contains three smaller tool kits. These are the 1/4 drive socket wrench set; the key set, socket head screw (allen wrench); and the automotive electrical tool kit.

The key set or allen wrench (fig 1-63) is a set of eleven "L" shaped tools stored in a canvas or plastic tool roll. The wrenches are made from tool steel in a bar fashion with six flat sizes or hex shape. The bar is bent in an "L" shape with 1/4 the length of the bar bent at a 90-degree angle.

Fig 1-63. Allen Wrench.

The wrench is used for socket head screws also known as set screws, allen head screws, or plugs. The screws are used to tighten gears on drive shafts, as water plugs, and other applications where it is not desirable for the head of the screw to protrude. The kit contains fractional widths fro 1/16 to 3/8 (and one wrench measured at 0.05.)

To use this type of wrench, you should put the short arm into the screw and turn with the longer arm to maximize the force available to you. When the screw is broken loose, you may use the longer end of the handle to remove the screw. In the case of severe rust, the use of a few drops of lubricant on the screw may help. The smaller sizes are easily bent and damaged by too much force. If you use the wrong size, you may round the wrench or the inside of the screw head. These wrenches should be kept dry and stored in the tool roll. Damaged wrenches should be replaced; dressing will only serve to reduce the proper size.

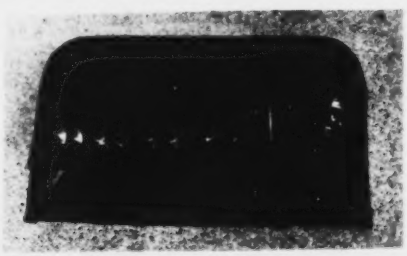


Fig 1-64. Automotive Electrical tool kit.

The automotive electrical tool kit (fig 1-64) is comprised of a screwdriver, a slip joint pliers, and nine double-headed, open-ended, midget wrenches. These tools are stored in a canvas or plastic tool roll. The screwdriver is four inches long with a two-inch blade and a 1/8 -inch flat tip. The pliers are a five-inch long pair with an angle nose and multiple tongue. The wrenches are sized between 3 and 4-1/8 inches long. The ends are 125 degrees offset on one end and 60 degrees on the other.

This kit is used mainly on ignition systems and should not be modified in any way. Broken or damaged tools should be replaced. Tools should be stored at all times in the tool roll when they are not being used. These tools, because of their small size are easily lost or misplaced. Your tool may be be slightly different as there are many types bought by the Marine Corps. Figure 1-64 shows a kit with eight wrenches instead of nine.

EXERCISE: Answer the following questions and check your responses against those listed at the end of the study unit.

1. The "L" shaped wrench is known as the

   a. socket head screw
   b. MK-76 wrench
   c. screw set
   d. socket screw

2. The small tool kit that contains a screwdriver, pliers, and nine open-end wrenches is the

   a. electronic ignition kit.
   b. automotive electrical kit.
   c. electrical repair kit.
   d. stillson tool kit.

Work Unit 1-11. USE OF MISCELLANEOUS TOOLS

IDENTIFY THE USE OF THE PRYBAR.

IDENTIFY MAINTENANCE OF THE FLASHLIGHT.

STATE HOW THE USE OF THE PUTTY KNIFE IS DETERMINED.

The general tools covered in this work unit do not fit into any category (but their own.) These nine tools will be briefly identified as to their purpose, care and uses.

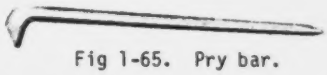


Fig 1-65. Pry bar.

The tool kit contains one prybar (fig 1-65), 15-16 inches long. The prybar has one end tapered to a point and the other end is offset 90 degrees to the bar. It is used for prying and aligning. The offset end is used for prying out gears, bushings, and so forth.

The pointed end is useful for aligning holes such as on vehicle panels and fenders. You should keep the pointed end and the leading edge of the offset dressed properly. It should be stored with a light coat of oil.

Fig 1-66. Paint brush.

The paint brush (fig 1-66) is a round brush with a tapered end. It is used mainly for cleaning areas on a battery, but can be used with a solvent to clean parts. It should be replaced when the synthetic beard starts to fall out or when it is broken. It should not be used for touch-up painting as the solvents remaining in the brush will discolor and ruin the painted surfaces.

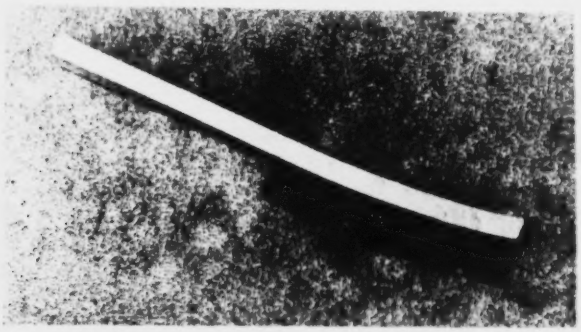


Fig 1-67. Wire brush.

The wire brush (fig 1-67) has a wooden handle with four rows of steel wire being imbedded in the flat surface on one side of it, approximately 2/3 of the length. This brush is useful in removing corrosion from batteries and terminals, preparing an area to paint, and removing rust from vehicles. The wires may bend and crush if used improperly. If necessary, you should trim wires that could protrude in different directions. These wires could cause you to short out a battery and, in the process, burn you. The brush should be replaced if the bristles become too short or crushed down close to the wooden handle.

The flashlight is a very handy feature of the tool kit. Two BA-30 batteries power this tool. It is used to provide light to a work area, such as in a vehicle or equipment engine compartment or at night. You should keep the light clean and free from tape or wire. The batteries should be taken out from time to time as they will corrode and cause a rapid rusting within the light. If the case of the light becomes badly damaged, it should be replaced instead of being taped. It should be stored on top of the other tools within the tool box to prevent breakage.

Fig 1-68. Pocket knife.

Pocket knives (fig 1-68) are used for light cutting and for screwing in adjustments. The knife in this tool kit has a single blade for cutting and a single blade with a screwdriver tip. The knife can be used for electrical work as the blade of the screwdriver has a wire-scraper surface. The pocket knife cutting blade can be sharpened (fig 1-69) with a whetstone or an oilstone.

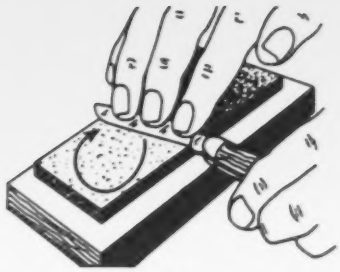


Fig 1-69. Sharpening a pocket knife.

The screwdriver blade should not be sharpened; the tip may be dressed in the same manner as a screwdriver. However, you must remember that the screwdriver blade is thinner and cannot stand as much dressing. The knife blades should not be used for prying as the blade may bend or break. Keep the knife clean with a light coat of oil on the blade when stored in the tool box.

Fig 1-70. Putty knife.

Putty knives (fig 1-70) were designed to apply putty to window sashes in setting panes of glass; however the putty knife can be used to clean off excess grease, help remove stuck-on gaskets, or for other cleaning as necessary. There are differences in types of putty knives, not only in their sizes but also by the bevel of the edge of the blade. The putty knife in the tool kit has a 1 1/4-inch wide blade that is flexible and allows you to use the edge effciently. Keep it clean and free from paint or sludge.

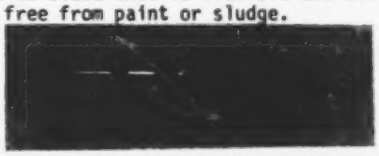


Fig 1-71. Electrical Circuit Tester.

The electrical circuit tester (fig 1-71) is used to test 24-volt systems. It may also be used to test 12-volt systems. You will use it to check for power in the electrical systems. You can quickly check the battery or merely push the ice pick shaped end into a wire to find the voltage. This tool can be used to test a circuit by testing each end of the wire between connections.

If there are 24 volts coming into the wire, the light in the handle will come on. Then check the other end of the wire. If the light turns on, the circuit should be good. If the light does not come on and you have made a good connection, then the circuit is broken . Check the wire for a break or shorting out on another metal object. The pointed top should be kept sharp enough for the job it was intended to do. Keep it clean and replace it when the light or handle is broken. If you are able to disassemble the handle, you may be able to replace the bulb, but in most cases the handle is sealed.

Fig 1-72. Crowfoot wrench.

The crowfoot wrench (fig 1-72) for the M-76 Amphibious Vehicle may be found in your tool kit. It was designed to be used to remove water tight spark plug cables from the spark plug; however, this wrench may be used for other applications, as needed. It has an "L" shaped handle. It resembles a crowfoot socket with a permanent socket handle and extension. The size of this tool is 3/4 inch. It should be stored having a light coat of oil on it.

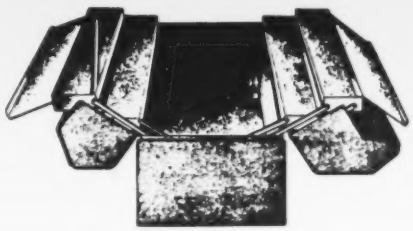


Fig 1-73. Tool Box.

The box may have a single tray with a padlock on the top, or may open from the top with a series of drawers on the side with a built-in lock. In any case, keep the tool box in good shape and do not treat it like a sack of potatoes, but like one of your tools.

EXERCISE: Answer the following questions and check you responses against those listed at the end this study unit.

1. The prybar is designed for a dual purpose, prying and

   a. aligning.
   b. hammering.
   c. punching.
   d. chiseling.

2. The flashlight should be repaired by means of using

   a. tape.
   b. glue.
   c. heat the outside area and press together.
   d. a new light bulb only or replace it for breaks.

3. The major method in determining the use of the putty knife besides size is the

   a. bevel of the edge.
   b. thickness of the blade.
   c. shape of the handle.
   d. spacing of the teeth.

Work Unit 1-12. INVENTORY OF THE TOOL KIT

EXPLAIN THE PURPOSE OF THE SL-3.

Your tool kit must be inventoried on a regular basis. This is done in various ways in different shops, but the basis for the inventory is the SL-3. The SL-3 is a stock list that identifies the components of the tool kit in an alphabetical order. You are provided with a description of the whole tool kit as well as individual descriptions of each tool. The tools stock numbers are provided for reordering purposes. They also provides the quantity of tools provided for each stock number.

Your tool kit rates four SL-3s (fig 1-74). These are for the tool kit itself; Key Set, Socket Head Screw; Tool Kit, Automotive Electrical; and Wrench Set, Socket (1/4-inch drive). A copy of these SL-3 should be kept in your tool box for your inventories; some shops may have locally produced inventory sheets in the box instead. You must rely on the local inventory procedures set up in the shop.

The inventory may be done on a tool box inventory board that has a silhouette of the tool on it. In this manner, lay out the whole tool kit on this board and missing tools will show up as a space that is empty. While this an easy procedure to use, it does not allow you to check the condition of your tools. The inventory is done not only to show that you have all the tools, but to show that the tools are in a serviceable condition.

Your inventory is initialed by you and usually your shop chief. The shop chief should verify that your inventory is correct; however, he may rely on you to make sure the inventory is correct.

If you have broken tools or missing tools, note this on your inventory and report it to the shop chief. This will initiate the necessary actions needed to replace the tool on tools.

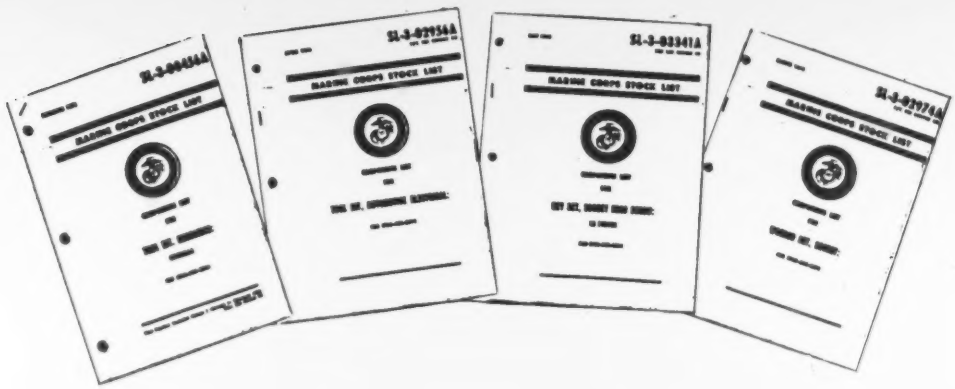


Fig 1-74. SL-3's.

EXERCISE: Answer the following questions and check you responses against those listed at the end this study unit.

1. The purpose of the SL-3 is _____.

2. The four SL-3's you should be concerned with when conducting an inventory of the General Mechanics Tool Kit are:

   a. _____

   b. _____

   c. _____

   d. _____

Answers to Study Unit #1 Exercises

Work Unit 1-1.

1. c.

2. stored in the company safe, supply office, or the shop office.

3. his hands

4. To keep either the tools or your hands from slipping

Work Unit 1-2.

1. b.

2. b.

3. a.

4. c.

5. a.

Work Unit 1-3.

1. b.
2. d.
3. d.

Work Unit 1-4.

1. c.
2. b.
3. slip joint and channel lock
4. d.
5. b.
6. c.

Work Unit 1-5.

1. b.
2. a.
3. c.
4. c.
5. you are working with odd sized nuts or bolts
6. a.
7. d.
8. h.
9. a.
10. g.
11. f.
12. e.
13. c.
14. a.
15. b.

Work Unit 1-6.

1. d.
2. perforate.
3. b.
4. c.
5. grind them down to their original shape.
6. measuring their edge or tip.

Work Unit 1-7.

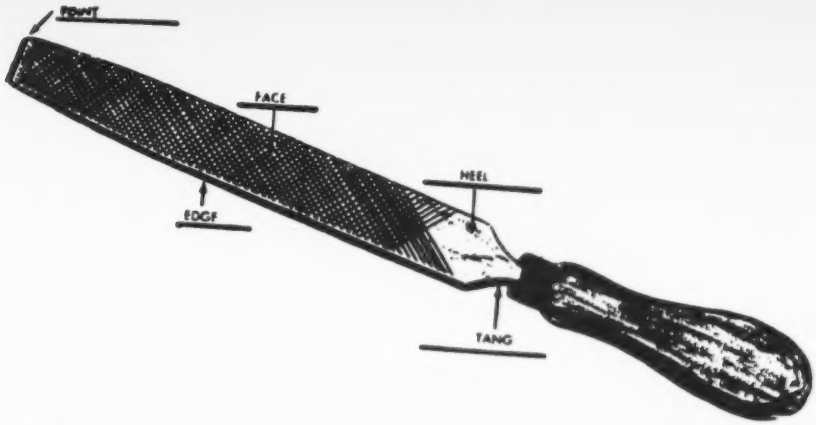
1. d.

2. Moving the file across the surface of the work in approximately a crosswise direction

3. Moving the file sideways in you hands and the cutting stroke forward with the face of the file against the work surface

4. Moving the file over the round surface in a rocking motion.

5.



Work Unit 1-8.

1. b.

2. d.

Work Unit 1-9.

1. c.

2. a.

3. b.

Work Unit 1-10.

1. a.

2. b.

Work Unit 1-11.

1. a.

2. d.

3. a.

Work Unit 1-12.

1. to provide an inventory list of components.

2. General Mechanics Tool Kit, Key Set, Socket Set (1/4"), Automotive Electrical Kit

STUDY UNIT 2

SHOP PROCEDURES

STUDY UNIT OBJECTIVE: WITHOUT THE AID OF REFERENCES, YOU WILL IDENTIFY TYPICAL SHOP PROCEDURES THAT MAY BE FOUND IN ANY SHOP. YOU WILL ALSO IDENTIFY SHOP LAYOUT FUNCTIONS, TYPICAL ERO FLOW, SHOP OPERATIONS, AND THE SHOP LIBRARY.

Work Unit 2-1. SHOP PERSONNEL

IDENTIFY THREE SHOP PERSONNEL.

When you report to the maintenance shop for duty, you will be introduced to the Maintenance Officer and the Maintenance Chief. Before you understand what your function in the shop is, you should know their functions.

The Maintenance Officer organizes the shop into a useful tool. It is his responsibility to ensure that the maintenance is done correctly and promptly. All of the equipment and personnel within the shop are under his control. As the Responsible Officer, he has signed a receipt for all of the tool kits that you will work with. This means that if you lose your tool box it is accountable to both the Maintenance Officer and you.

The Maintenance Officer serves within the policy of the Commanding Officer. This means that the Commanding Officer is also responsible for guiding the maintenance effort. After the Maintenance Officer has received guidance from the Commanding Officer on his policy, he will organize the shop as is required. Different shops will have different missions; therefore, no two shops will be run exactly alike.

The Maintenance Officer will identify training within the shop that will benefit the personnel. Training and learning have no peak, and they must continue all the time to teach you new methods and techniques and to reinforce the training you already have achieved. In a mechanics school, you will be brought from a backyard mechanic to the point of being a professional. If there is no training, you will always be just short of the mark. You should understand that the Maintenance Officer desires the professional attitudes and capabilities and strives for this with a well run training program.

The shop is broken down into different areas and the Maintenance Officer may assign you to a function other than being a mechanic. This is beneficial to you. You should know all of the functions within the shop, and one of the best ways to learn is to work in a different function for a period of time. Your assignment within the shop will depend on your training and experience.

The maintenance Officer provides the overall guidance for the maintenance effort within the shop. He ensures that records are correct, and done properly. The Maintenance Officer depends on the Maintenance Chief for the operation the shop.

The Maintenance Chief directs the maintenance effort in accordance with the guidance he receive from the Commanding Officer, Maintenance Officer, and Marine Corps directives or orders. He is responsible for the proper framework of leadership within the shop. He will make recommendations to the Maintenance Officer when required.

The Maintenance Chief must be knowledgeable of the maintenance management system which directs the maintenance within the Marine Corps. This system reports the status of the equipment that is in the shop for work. This information is needed daily for the most accurate reports possible.

The maintenance related programs fall within the Maintenance Chief's functions. These programs are calibration, modification, maintenance management, and the safety program. Programs such as these prove to be essential to proper maintenance and serve to protect both personnel and equipment from mishaps.

The Maintenance Chief assigns equipment repair orders to the Mechanic through the framework he has working. You may receive the repair order from an NCO, other than the Maintenance Chief, but this is usually done at his direction.

You, as the mechanic, are required to perform the assigned repair function in the correct manner and procedure. You may be tasked to perform a function other than one that is maintenance related, based on your experience. You may be the Tool Room NCO, Battery shop NCO, Records Clerk, or Dispatcher. You may have to paint the shop safety lines, walls, or the floor. All of this goes with being a mechanic. The tool room is a great place to learn about tools and supply procedures. The battery shop gives an understanding of safety and proper procedures. The office will make you aware of the mountains of paperwork required for the operation of a shop.

Remember that, as the mechanic you are the most are the most important tool within the shop. You must keep yourself proficient in your job. Without any member of the maintenance team, the job is made much harder to accomplish.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The Maintenance Officer organizes the shop within the guidance or policy of the

   a. Maintenance Chief.
   b. mechanic.
   c. Inspector.
   d. Commanding Officer.

2. The direction of the maintenance effort is set by the

   a. Maintenance Chief.
   b. Mechanic.
   c. Inspector.
   d. Commanding Officer.

3. The most important tool within the shop is the

   a. ballpeen hammer.
   b. inspection.
   c. crowfoot wrench.
   d. mechanic.

Work Unit 2-2. THE MARINE CORPS MAINTENANCE SYSTEM

IDENTIFY THE THREE CATEGORIES OF MAINTENANCE.

Every Marine and every unit has certain responsibilities for the maintenance of individual and organizational equipment. The Marine Corps maintenance system establishes a maintenance structure which is designed to assist both the individual Marine and the various units in the Marine Corps in accomplishing their responsibilities in a timely and effective manner. You, as mechanic, are a member of the maintenance team: consequently, you should know your responsibilities and their relation to the overall system.

Factors affecting maintenance echelons. The echelon of maintenance at which a particular repair or replacement is going to be performed depends on a number of factors. These include the combat situation, the nature of the repair, the time available, the number and skills of the available mechanics, and the availability of tools, test equipment, and repair parts, Repair is performed by the lowest echelon of maintenance which is capable or performing it. Higher echelons of maintenance perform the category of maintenance which is assigned to their units. The lower echelons of maintenance should not attempt to perform repairs which are assigned to a higher echelon. This generally leads to cannibalization of equipment and usually causes the lower echelon to neglect the work that is their primary responsibility. The effectiveness of the maintenance system depends on how well the men at the various echelons know and perform their own responsibilities. This breakdown of individual responsibilities within the system provides for a balanced workload, and there is generally more than enough work at all levels to keep everyone busy.

Organizational maintenance. This level of maintenance is the responsibility of, and is performed by, the using unit. Its responsibilities include correct operating, inspecting, servicing, lubricating, adjusting, and replacing of parts, minor assemblies, and sub-assemblies. Organizational maintenance is the foundation upon which the remainder of the system rests. If using unit maintenance is ineffective, equipment availability will be low and it will place a heavy demand on the maintenance capability of higher echelons. Organizational maintenance is broken down into the echelons: 1st, performed by the operator; and 2d, performed by the unit mechanics.

First echelon. First echelon maintenance is performed by the user, wearer, or operator, It consists primarily of correct operation, servicing, inspecting, lubricating, and performing minor adjustments. Just as organizational maintenance is the foundation of the whole maintenance system, so, 1st echelon or operator services are the foundation of good organizational maintenance. The equipment operator and the services he performed are two of he most important factors in the success of the maintenance system.

Second echelon. Second echelon is performed by specially trained personnel in the using organization, the unit mechanics. It consists primarily of inspecting, performing major scheduled lubrication services, making major adjustments, and replacing parts and minor assemblies. Depending on the organization, 2d echelon maintenance services may be performed either at company level or in centralized battalion maintenance shops. While the mechanic is responsible for parts replacements, both the operator and mechanic will generally combine their efforts in performing scheduled preventive maintenance services and services and making adjustments.

Intermediate (field) maintenance. This level of maintenance is authorized and performed by a designated maintenance activity in direct support of the using organization, or by higher echelon maintenance units supporting the direct-support maintenance activity. It is normally limited to the replacement and repair of parts, subassemblies, and major assemblies. When necessary, intermediate maintenance units support lower echelons by providing technical assistance, mobile repair crews, and repair parts. Intermediate maintenance consists of 3d and 4th echelons of maintenance.

Third echelon. Third echelon maintenance is performed in direct support of the using units by the FSSG. Third echelon maintenance shops have the necessary special tools, machine shops, mechanics, and repair parts to perform more specialized maintenance then the using units. Since many organizations in a Marine division contain varying amounts of similar equipment, 3d echelon maintenance capabilities have been centralized in the engineer maintenance companies of FSSG. Thus the number mechanics, spare parts, and special tools required prevents duplication of effort and results in savings of manpower and equipment.

Fourth echelon. Fourth echelon maintenance is also performed by FSSG. The FSSG has more elaborate shop facilities and more mechanics and is limited only by the tools, test equipment, and repair parts authorized. Fourth echelon maintenance is the highest level of intermediate maintenance, and any equipment requiring more specialized repair or complete rebuild is forwarded to the last category of maintenance, depot.

Depot maintenance. This level of maintenance consists of a single echelon of maintenance, 5th. It normally supports the supply function by rebuilding and returning to stock, parts, subassemblies, assemblies, or the whole item of equipment on a scheduled basis. Fifth echelon maintenance is generally performed at the two Marine Corps logistic support bases. Authorization may be granted for deployed organization to perform limited 5th echelon repairs.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. Maintenance performed by the operator falls into the category of_____ maintenance.

   a. organizational
   b. intermediate
   c. specialized
   d. depot

2. Maintenance for first and second echelon falls into the category of_____ maintenance.

   a. organizational
   b. intermediate
   c. specialized
   d. depot

3. Major rebuilding of equipment is in the category of_____maintenance.

   a. organizational
   b. intermediate
   c. specialized
   d. depot

4. Third and fourth echelons fall into the category of_____maintenance.

   a. organizational
   b. intermediate
   c. specialized
   d. depot

Work Unit 2-3. EQUIPMENT REPAIR ORDER (ERO) FLOW WITHIN THE SHOP

IDENTIFY ONE WAY IN WHICH AN ERO IS INITIATED.

IDENTIFY THE MECHANICS USE OF THE ERO.

IDENTIFY WHERE THE ERO IS FILED.

The ERO (fig 2-1) will be your most often used tool in the shop. It is a tool in the respect that is shows the work to be done and allows ordering information to be filled out on an accompanying form called an ERO Shopping List (EROSL). The ERO is used to repair the vehicle, and the EROSL is used to order the repair parts. This all sounds easy enough, but what is ERO flow?

ERO flow is the complete procedure of the ERO from initiation to completion. For instance what happens when a new item is received in the unit. First of all, acceptance limited technical inspection (LTI) is done to show the condition of the item. After the LTI is done, the item is found to have a deficiency. An ERO is initiated by the administrative area of the shop to correct this deficiency. The proper repair parts are ordered on the EROSL using the information received from the LTI. Supply will order the parts and set up a layette bin for the ERO. After a time, all the parts are in and the layette contains all of the repair parts. The mechanic then draws the ERO and the parts for the work. When the work is complete, the mechanic fills out the ERO and signs it return. An inspector will inspect the work, sign the ERO, and returns the ERO to the administrative area where it is taken apart and filed. The white copy of the ERO and the original copy of the EROSL are filed in the record jacket. The green copy of the ERO is filed as a shop record. The yellow copy also used as a receipt for equipment turned in to another shop, may be discarded with the pink copy. Shops may have a local policy such as keeping the pink copy in the layette and the rest of the ERO in the administrative area with supply retaining the pink copy as a record in a file.

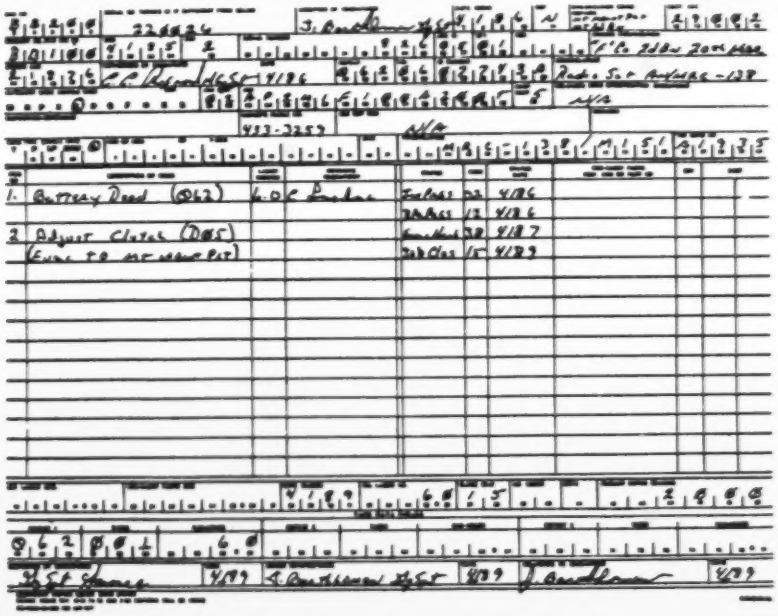


Fig 2-1. The Equipment Repair Order.

Of course, the ERO itself can be initiated when equipment breaks down, but the LTI should always be done first. ERO's can be initiated at the time when a major preventive maintenance is due, as a result of a major inspection such as an IG or CG, or when any modification or calibration is needed. Modifications are directed from higher headquarters and the ERO is initiated depending on the urgency of need.

Remember, that after your work on the ERO is complete, the inspector will check your work to ensure that it is in fact, complete and proper.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. If a defect in equipment is found during a limited technical inspection, it is corrected on the spot or

   a. the next day.
   b. an ERO is opened.
   c. ignored.
   d. another LTI is done.

2. When the work is complete, the mechanic fills out the ERO and

   a. shopping list.
   b. order forms.
   c. signs it.
   d. presents it to the Maintenance Officer.

3. The white copy of the ERO is filed

a. in a log book.
b. separately from other records.
c. in the toolroom.
d. in the record jacket.

Work Unit 2-4. SHOP OPERATIONS

IDENTIFY MAINTENANCE PLANNING.

IDENTIFY QUALITY CONTROL.

The next step that you should be concerned with is maintenance planing. The way the shop functions is the end result of maintenance planning. The goal of shop maintenance planning is to maximize the use of equipment through efficient and timely repairs or maintenance. Although this is a general statement, it covers the basic requirement to keep the gear in running condition.

The Maintenance Chief plans the maintenance for the shop. It is his mission to evaluate the guidelines has has been given as to what work has priority. When all the parts are in, the job can be done, but where and by whom? The Maintenance Chief makes this decision based on several factors:

a. Is the vehicle combat essential? Certain vehicles are termed combat essential and, as such, may be given a higher priority. This terminology is provided by Marine Corps Orders.

b. What do the current conditions dictate? If there is a project that is going on is the equipment or vehicle essential for that mission. In this case, if the parts are in, the Maintenance Chief may give this work a higher priority.

c. Who's available? Each mechanic has a level of experience and training that has to be balanced against the job. Mechanics with more experience and training are likely to be assigned more difficult work than the new mechanic.

d. Is the space available? There may be a need for a service area with lots of space or other special requirements. This may be based on which vehicle will be repaired sooner, in the case of the shop where the service areas are all in use.

e. Are the proper tools on hand? Some tools may be broken and on order, or there may be tools and test sets at the calibration shop.

These five factors must be considered when the maintenance planning is done. Scheduling of the maintenance is the next step. The length of the job and commitments must be weighed. The right mechanic may be taking leave or going to the rifle range.

Once the maintenance planning is done, the work should follow in a smooth transition. All maintenance planning is flexible to allow for unexpected occurrences.

You, as the mechanic, can be reasonably sure of what you will be doing from day to day. You should be concerned with an upcoming job to the extent that you either feel proficient with it or are at least able to find the appropriate directions in the technical manual.

Besides the combat deadlined items, other items not running are considered to be deadlined or administratively deadlined. The difference between these two forms of deadlines may be the reason for which it is down. One reason for the deadline is when the equipment runs roughly and needs adjustment. Administrative deadline can be caused by a number of things it could be safety deadlined because of a problem that other units have reported it could be safety deadlined or administratively deadlined for an urgent modification when the contents of the Modification Instruction are not known.

As a mechanic performing he maintenance , you should be aware of any quality control procedures used within your shop. You know that there is an inspector who checks the work you are doing before, during and after. These checks are a form of quality control. The care that you take to ensure the job is done correctly and that your tools are in tiptop shape is quality control. Quality control is a necessary part of maintenance planning is ensures that the job is done correctly, that proper tools are used, and that proper repair procedures are followed.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The way the shop functions is the end result of

   a. maintenance planning.
   b. highly trained mechanics.
   c. a well stocked toolroom.
   d. maximized use of tools.

2. Quality control ensures that the job is done

   a. quickly.
   b. cheaply.
   c. correctly.
   d. with motivation.

Work Unit 2-5. THE SHOP LIBRARY

IDENTIFY THREE PUBLICATIONS.

When you are assigned an equipment repair order within the shop, you may want to consult a technical manual. The technical manual will show the correct repair procedures. It will cover disassembly of the required item, step by step. When the repairs are complete, it will explain the method for reassembly. The manual contains figures that are broken down to show the parts and their order of assembly.

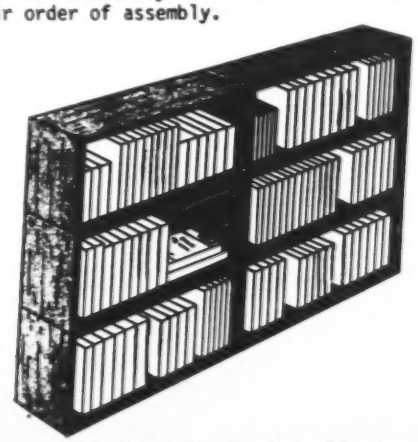


Fig 2-2. The shop library.

When you would perform an LTI, you could use the technical manual to show the troubleshooting procedures. Troubleshooting basically means that you have to find out what is causing the item to be broken. In the technical manual, there there are tables that will cross match the symptom to a cause and the recommended corrective actions (fig 2-3.)

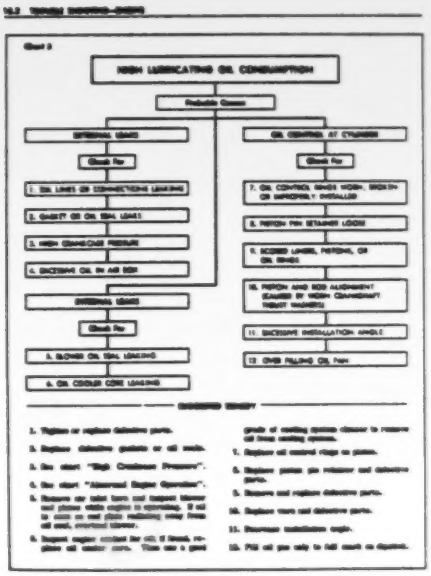


Fig 2-3. Troubleshooting excerpt.

When the troubleshooting is done, refer to the SL-4. The SL-4 is a stock list for parts. The SL-4 shows diagrams as to what precise part you may need. These diagrams are identified as a reference figure in the listing of parts and stock numbers. When you have identified the parts that are required, you need only find the stock number for each part. Verify by checking the illustration to ensure that you have the right part (fig 2-4). The stock number, known as a National Stock Number, will be entered in the appropriate slot on the ERO Shopping List. The listing of the part will also contain the unit of issue such as EA for each, KT for kit, HD for one-hundred, etc. Next to this is a column identified as the quantity used in the unit. Be careful here, this refers to the whole unit and not the one area you may be dealing with. When you turn the EROSL in with the parts you have identified to supply, personnel here will ensure that the repair parts are within your echelon of repair.

The SL-3 is a stock list for the components of a piece of equipment or a tool kit. Newer stock lists contain the inventory forms as a part of the SL-3, therefore, you will not have to maintain a separate form for the inventory. The SL-3 contains the stock number, quantity, and unit of issue for each component.

These are the three major publications that you will deal with. The technical manual, in some cases will be set up to contain the information of the SL-4 also. These dual publications are used in the same manner as the separate publications.

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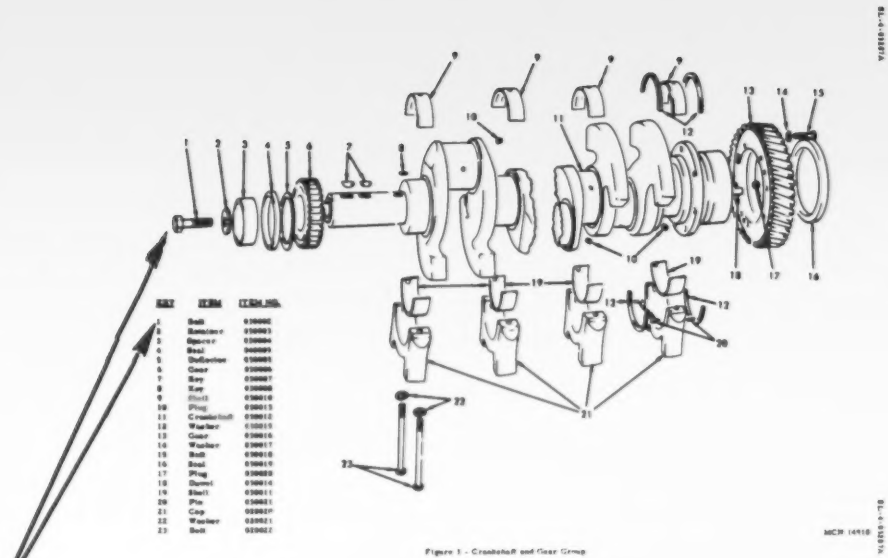

Figure 1 - Crankshaft and Gear Group

SL-4-03307A

MARINE CORPS STOCK LIST

SL-4-03307A

PART I - ITEM IDENTIFICATION LISTING

(1) ITEM NO.	(2) CODES	(3) STOCK NUMBER	(4) REF DESIG FIG.-NO.	(5) I.D.	(6) ITEM IDENTIFICATION	(7) UNIT OF MEAS.	(8) QUANTITY (A) PER ASSY	(8) QUANTITY (B) PER END ITEM	(9) SMR CODE	(10) I.C.	(11) RECLAMATION FACTOR
					CHAPTER 03						
030001					CRANKSHAFT AND GEAR GROUP						
030002		5306-271-6308	03 - 1	D	BOLT, RETAINER	EA	1		P1ZFC		.025
030003		5310-[illegible]-6353	03 - 2	D	RETAINER, PULLEY	EA	1		P1ZFC		.02
030004		5360-[illegible]-0968	03 - 3	D	SPACER, SLEEVE, S, 1.903 ID, 2.000 OD, 2.813 IN LG	EA	1		P1ZFC		.006
030005		5315-[illegible]-0181	03 - 5	D	DEFLECTOR, DRIP AND LEAKAGE	EA	1		P1HNC		.002
030006		5315-[illegible]-0153	03 - 6	D	GEAR, SPUR, S, 48 TEETH, 2.625 W FACE, 4.200 OD, 8.875 IN LG	EA	1		P1HNC		.02
030007	MU	5315-016-5531	03 - 7	D	KEY, WOODRUFF, S, A8 KEY NO 1218, WHITNEY KEY NO 9	EA	2		P1ODC	D	
030008	MU	5315-012-6049	03 - 8	D	KEY, WOODRUFF, S, A8 KEY NO 606, WHITNEY KEY NO 9	EA	1		P1ODC	D	
030009		3815-662-8951		D	BEARING, SLEEVE	EA	5		P1HNC		.047
030010			03 - 9	C	† SHELL, UPPER	EA	5		X1		
030011			03 -10	C	† SHELL, LOWER	EA	5		X1		
030012		3815-384-1514	03 -11	D	CRANKSHAFT, ENGINE	EA	1		P1HNC		.02
030013	MU	4730-018-9566	03 -12	C	PLUG, PIPE, S, SOLID BODY, 1/8-27 NPT	EA	4		P1ODC	D	
030014			03 -13	C	DOWEL	EA	2		X2		
030015		3815-511-3336	03 -13	D	WASHER, HALF THRUST	EA	4		P1HNC		.04
030016		3815-331-6798	03 -13	D	GEAR, HELICAL, S, 78 TEETH, 4.749 ID, 6.000 OD, 1-3/16 FACE	EA	1		P1HNC		.02
030017	MU	5310-637-9841	03 -14	D	WASHER, LOCK, S, 3/8 NOM BOLT, 0.406 ID, 0.594 IN THK	EA	6		P1ODC	D	
030018		5306-176-1126	03 -15	D	BOLT, MACHINE, S, HEX-HD, 3/8-24 UNF, 1-3/16 IN LG	EA	6		P1HNC		.025
030019		5330-083-9496	03 -16	D	SEAL, PLAIN, ENCASED, S, 6-11/16 ID, 5.751 IN OD, 9/16 IN W	EA	1		P1HNC		.046
030020		4730-063-9988	03 -17	D	PLUG, PIPE, S, SOLID BODY, 1/16-27 NPT	EA	1		P1HNC		.001
030021		5315-016-1346	03 -20	D	PIN, STRAIGHT, HEADLESS, SAE, 0.188 IN OD, 1/2 IN LG	EA	4		P1HNC		.002

3-1

Fig 2-4. SL-4 excerpt showing illustration to nomenclature.

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The numbering system of the manuals may be set up in unison with the identification number of the equipment. The ID number of the General Mechanic Tool Kit is 00456A and the SL-3 is SL-3-00456A.

It may also follow the Federal Supply Code which is the first four digits of the National Stock Number. Generally, for a diesel engine the first four digits are 2815, and a TM may be numbered TM--2815-15.

Using this same number you can tell more, the 15 at the end of the number refers to the manual being used for echelons 1 through 5. For instance if the manual was TM--2815-12, it would be for diesel engines and echelons 1 and 2, which are organizational. If the number was TM--2815-45, It would be used for diesel engines at the 4th and 5th echelon which are intermediate and depot level.

Modification instructions are publications which provide information required to modify an assembly. These modifications are important for the proper operation of equipment and the correction of defects. A record of the modifications that have been done to any item will be retained in the items records.

Technical instructions (TI) are instructions that often precede a modification instruction. These TI's often make you aware of a problem that other units have experienced with a piece of equipment that you may have to work on. At times, they may identify the correct kind of brake fluid for a particular piece of gear. They may relate a problem that is presently occurring with a piece of new gear or new procedures for repairing. These TI's are really a coverall and you should read these to acquaint yourself with them. They cover new publications that have just been published and are available for ordering. Supply Instructions (SI) may identify a new stock number for oils or tell you what is available in the system for new piece of gear.

The Table of Authorized Publications (TAP) is a list that your unit has submitted that shows all the distribution codes of publications that your shop needs. If you need a publication that is not on hand, check with supply to find out if you rate the publication. It may be ordered at this time. New publications are usually force fed. This means that you will automatically receive any new publications that fall within the distribution codes your unit has requested in the TAP.

The library itself (fig 2-2) is set up by the shop. There should be backup manuals retained in case the manual in the library becomes soiled or lost. The Marine in charge of the library will have some sort of a locator deck or log book set up so he knows all the information contained within the library. It is his responsibility to order missing manuals, enter new changes, and keep the manuals current. From time to time, information or procedures in the manuals will become outdated. When this happens, there will be a change sent out incorporating the new information. For instance, the SL-3 for the General Mechanics Tool Kit presently has even changes. These changes dropped some tools from the inventory and changed the stock numbers on other. Since these were pen changes, all that is done is the old information is crossed out and the new information is written in. A change may also be a page insert in which case all that is done is that the old page is removed and the new page is inserted.

The library is another important facet of the shop. You should use care to ensure that the manuals do not become overly soiled.

True, they will have fingerprints in them because as you follow a procedure while you are working, the pages get soiled. A little oil or solvent will ruin the manual as it may smear the ink and the next Marine using the manual may not be able to read it. Remember to put the book back where you found it when you are finished with it. A missing manual is like a missing tool if it is not there when you need it, then you have to look for another one.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The publication that is a components list is the

   a. SL-3.
   b. SL-4.
   c. MI.
   d. TM.

2. The publication that will show the parts needed for repairs and their stock numbers is the

   a. SL-3.
   b. SL-4.
   c. LO.
   d. SL-8.

3. The publication that shows details of assembly and disassembly along with explanations of procedures is the

   a. SL-3.
   b. SL-4.
   c. TM.
   d. LO.

4. The publication that deals with a new change to the structure of equipment and how and where to change it is the

   a. SL-3
   b. SL-4
   c. TM.
   d. MI.

5. The publication that deals with a new procedure that later may become a modification is the

   a. SI.
   b. LO.
   c. TI.
   d. MI.

Work unit 2-6. SHOP PROCEDURES

IDENTIFY THE FUNCTIONS OF THE TOOL ROOM.

IDENTIFY ONE FUNCTION OF SUPPLY.

IDENTIFY THE BATTERY SHOP.

IDENTIFY THE LUBRICATION AREA.

IDENTIFY THE SERVICE AREA OR WORK BAY.

The shop is broken down into areas that will achieve that most efficiency for the maintenance required. The floor plans for each shop will vary a great deal from one shop to the next. The size and floor plan of your shop will depend largely on the level of maintenance you are responsible for performing. An organizational level shop that does mainly preventive maintenance will be set up for the purpose. An intermediate level shop will be set up to do mainly corrective maintenance (repairs). In general, the shop will consist of an administrative area, tool room, issue point, battery shop, lubrication area, and service area. Since not every shop is set up the same, you will learn typical shop procedures that may or may not apply specifically to your shop.

The administrative area is the headquarters of the shop. This is where the Maintenance Officer and Maintenance Chief have their work areas. The records and training records are located here. This is not a repair area so no work should be brought here. All questions you may have are usually answered here. The administrative office will take care of the scheduling of maintenance. The publications that you will need to do the required work may be stored in this area.

The tool room (fig 2-5) is located in a central location to complement the work areas. The tool room has four specific functions: issuing and receiving tools, repairing or replacing tools, servicing and maintaining tool, and providing secure storage for tools. The shop will have a procedure for checking out and turning in tools. This procedure may utilize a log book where you sign for each tool you check out. This signature makes you responsible for the care of the tool and it also tells the tool room NCO the location of tools. At the end of the day, this log will ensure that all tools that have been checked out do not end up in someone's tool box.

Fig 2-5. Tool room.

Tools are heavily used and will therefore, wear out or break. In this case, the tool room NCO must maintain these tools or have them replaced. He will report any tools that are broken through abuse or improper use. At the same time, he must maintain the tools. If the hammer handle starts wearing out, he must initiate actions to replace the handle before it breaks. He must examine tools where they are serviceable. Some of the tools in the tool room may require calibration. Calibration is needed on equipment that measures or tests. This process is done to ensure that the measurement is accurate and will not damage your work.

Tools must be kept secure. Security of the tool box is accomplished by the padlock provided with the tool kit. The tool room needs this type of security also. It should never be left unlocked and unattended. If you need a tool and the tool room NCO is not there, the desire to complete your work may entice you to walk in and take the tool. This results in a missing tool. The only man in the tool room should be the tool room NCO or his supervisors.

The issue point of the shop is supply (fig 2-6). This area will order the repair parts that are requested. Everything that you use as a mechanic has to have come through supply atone time or another. the supply area has a layette area (fig 2-7) that contains the repair parts for each vehicle or equipment repair order (ERO). This area is where your parts are stored until enough are in to make your repairs. Supply will serve all sections of the shop area providing forms, oils, grease, tool, etc.

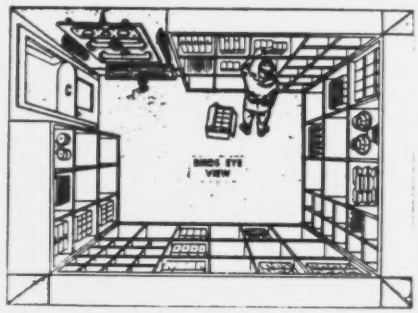


Fig 2-6. Supply.

Within supply there will be an area termed the expendable items area or pre-expendable bins. This area contains a great many low value, high usage items such as nuts, bolts, and cotter pins. These items may be drawn from supply when required. This is useful when a bolt is stripped out or a cotter pin is too badly bent to use. It may not be with the repair parts, but you may find what you need in the pre-expendable bins.

The same here applies to supply. You should not go into the supply area without the supply personnel being there. Parts must not be removed from the layette bins and used to keep another vehicle running. The parts are all accountable for and the supply procedures must be followed.

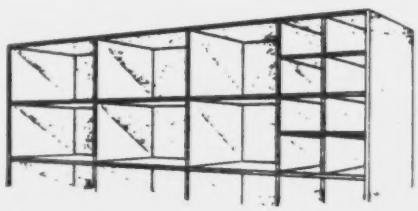


Fig 2-7. Layette bins.

The battery shop serves as a repair area for the batteries that need a charge. Here new batteries are also put into service. This area usually has an emergency eyewash or shower in case acid is spilled in your eyes or on your skin. Maintenance of batteries is centralized and because of this your job, as a mechanic, is made a little easier. The Marine in the battery shop has been educated according to procedures used. You as a mechanic basically know what the job involves. However, you should not work on batteries in this area unless directed.

Most shops will have either a lubrication rack (fig 2-8) or an area set aside perform lubrication work. This is a preventive maintenance area and is set up to use oils and lubricants. The rack is usually a type that you would drive the equipment or vehicle up onto using a guide. Once upon this rack, you will have access to the underside of the item requiring work. This also allows corrective maintenance on the underside of the item to be much easier. Other shops will have a pit (fig 2-9) formed into the floor with a stairs at one end. The principle here is the same easy access to the the underside of the item. There are other lubrication areas that use a hydraulic lift to lift the vehicle allowing access to the underside. Here you must remember to lift no more than the rated capacity of the hoist. When you use this lift, remember that the load must be centered and high enough for access only. The higher the item is lifted, the more hydraulic power is required to hold it stationary. After using any lubrication area, it must be clean because oil or grease on the deck could cause a slipping injury.

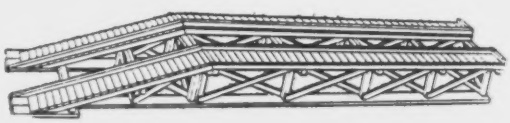


Fig 2-8. Lubrication rack.

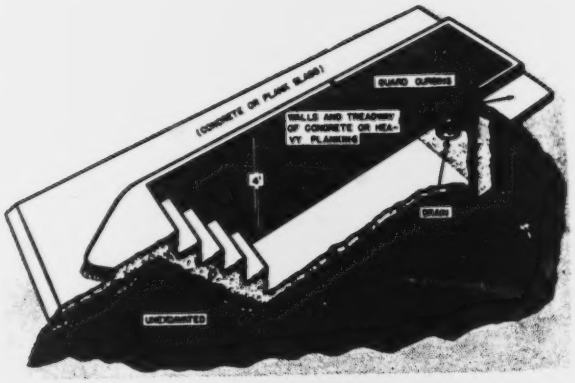


Fig 2-9. Grease pit.

The service by or work area is generally the area set aside for corrective repairs. This area should have benches nearby for you to work and for your tools. You should have some sort of access to electrical power in the event you are required to use a power tool. This area is where to apply your professionalism and, as such, all the good habits you have developed. Keep your work area as clean as possible. Clean spilled oil quickly with an absorbent material.

The maintenance shop is where you have to work and it will work very efficiently when you know each part of the shop and the various functions of each area. Although all areas of the shop have not been covered here, the major areas have been discussed.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The tool room has four main functions. These are issuing and receiving tools, repairing or replacing tools,_____, and

   a. clean and display tools, and provide secure storage for tools.
   b. service and maintain tools, and provide secure storage for tools.
   c. provide secure storage, and issue special items.
   d. service and maintain tools, and provide assistance for the mechanic.

2. Supply has a pre-expendables bin which may contain

   a. high value parts.
   b. batteries and fuel tanks.
   c. seldom used parts.
   d. low value, high usage parts.

3. The area within the shop that has a emergency eye wash and shower is the

   a. head.
   b. administrative section.
   c. lubrication area.
   d. battery shop.

4. Access to the underside of vehicles and equipment is made easier by the use of the

   a. head.
   b. lub rack or pit.
   c. driveway.
   d. chain hoists.

5. The service bay or work area is generally the area set aside for

   a. corrective maintenance.
   b. tool storage.
   c. charging batteries.
   d. test driving equipment.

Work Unit 2-7. SHOP EQUIPMENT

IDENTIFY ONE LUBRICATING TOOL.

IDENTIFY THE USE OF BENCH GRINDER.

IDENTIFY ONE USE OF THE AIR COMPRESSOR.

IDENTIFY THE USE OF TUBING TOOLS.

IDENTIFY THE TAP AND DIE SETS.

The tools in the General Mechanics Tool Kit are insufficient to perform all required maintenance without the help of shop equipment. These items will be found near the tools in every shop. Your shop may not have all of these items, but you should be aware ofthem as they will make your job easier and more efficient.

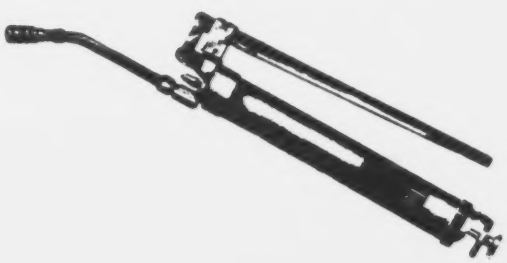


Fig 2-10. Lever-Operated Grease Gun.

The basic tool in the shop is the mechanic, but a close second is the grease gun (fig 2-10). Grease is used to lubricate nearly all pieces of equipment. Not all models are the same, and some of the grease guns seem as if they never work and that can be irritating. The grease gun that will be discussed is here the hand lever type. With this type, hand lever pressure pumps grease, through a coupler on the end of the gun, into a grease fitting on the part to be lubricated. The coupler end may be attached to the grease gun by means of a rigid tube or a flexible tube. The coupler (fig 2-11) itself has three metal jaws which should be kept clean and checked regularly during use. The main body of the grease gun is a tube which will hold approximately on pound of grease.

On the end of this tube is a spring-tensioned handle. To prepare for filling of the grease gun, pull this handle to the rear and slide the shaft of the handle into a notch in the end cap. Unscrew the end cap and you have access into which you must put the grease. You should fill the end by hand, pushing the grease into the tube with your fingers. A harder method is to push the tube into the grease and pull back on the handle to suck the grease into the tube. It is harder since you work in grease your hands will be slippery and may slip, Worse than this, on some types, the grease will get into the spring area and it will be nearly impossible to pull back on the handle. Once the tube is filled, screw the end back on, pump the handle rapidly to expel the air and the grease will start. When expelling the air, pump the grease gun into a rag or the grease will fly and make a mess.

Fig 2-11. Cross section of typical grease fitting and coupler.

There may be a five-gallon bucket for the grease (fig 2-12) with a pump lever on it; the principle is the same. This bucket will allow you to hit the hard to reach areas with someone else doing the pumping. On some of these buckets, there will be no lever, only an air receptacle. In this case, air pressure does the pumping and you only press a trigger. You must be careful with the air powered lubricator as the grease pumps out at a greater pressure and can create a mess if not firmly on the grease fitting.

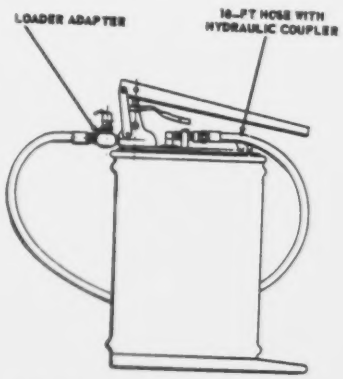


Fig 2-12. Grease bucket.

There may also be a five-gallon bucket used for pumping oil into an engine or gearbox. These also may be powered by a lever or air. The important quality of the five-gallon buckets is that they can do more because of the increased mount of lubrication that is available. The drawback is that is usually takes two men to use them.

When you need to add oil and do not need the five-gallon bucket, you should use the measuring cans. These can hold anywhere from a pint to a gallon. There is usually a thumb release for the oil to flow out the spout. Usually, you can avoid making a mess by the knowledge of how much oil is needed and by not overflowing or missing the oil fill hole.

From time to time, you will need to use the bench grinder (fig 2-13). This is an electrically powered tool that has a central motor and a grindstone wheel at each end or wire brush at one end. You should notice that there is an eye protection shield over the tool rest on each side. This is needed to protect your eyes form the flying metal as you grind, but you should also wear a face shield or goggles when using it. The tool rest should be set as 1/8 inch from the grinding wheel.

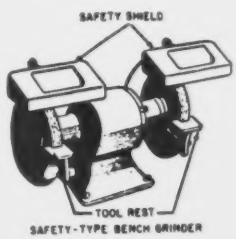


Fig 2-13. Bench grinder.

The grinder should be mounted on a bench that is kept clean and free of storage or flammables. As the metal is ground, sparks will fly, which could start a fire.

CO

Check the grinding stones to ensure that they are not cracked or badly worn (fig 2-14). It the wheel is worn down more than one-third of its original diameter, it should be replaced. There is a possibility that a tool could grab in a broken area and be thrown back at you. In any case, a worn wheel will not help you to dress the screwdriver tips and chisel edges.

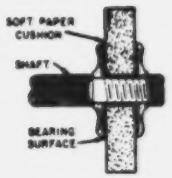


Fig 2-14. Correctly mounted wheel.

The air compressor can be widely used in the shop. Besides filling tires or powering the grease and oil cans, it can be used to clean dirt or sludge off of parts. Wear goggles and gloves if you use it for this purpose. Dirt or sludge will be blown off of parts at a high speed and could injure your hands or damage your eyesight. Be careful with air because compressed air if injected into a cut can cause death. Compressed air is used for impact wrenches, solvent tanks, and other pneumatic tools.

Hose and tubing tools are used to repair and replace most fuel, brake, and hydraulic lines that are made from a soft metal such as copper.

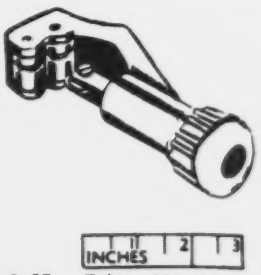


Fig 2-15. Tube cutter.

The cutter (fig 2-15) has a knurled top which is tightened as a cutting wheel and two rollers move over the work. The cutter moves in a circular path until the wheel has cut through the soft metal. The knurled cap must be tightened slowly so as not to crush the work. When the wheel has cut completely through, the edge will be at a right angle from the sides. If the tube needs to be angled, you should use a coil wire (spring) tube bender (fig 2-16). This bender applies an even pressure on the work to prevent crimping or damaging the tube. All metal lines should have some slight bends in them to allow for expansion and contraction. Now that the tube is cut and bent properly, you may need a flaring tool to provide the best fit. The flaring tool (fig 2-17) consists of a die block that holds the tube. A yoke with a cone fits over the die block. On this yoke, there is a tool handle. The cone end fits into the end of the tube and the handle is turned. This action forces the end of the tube to flare out. Allow it to flare out only as much as needed. Use a steady pressure so as not to crack the edge of the tube. Now, the tube is all set to go on. This is right if you had put the fitting on before you flared the end. Remember this as it will save you time.

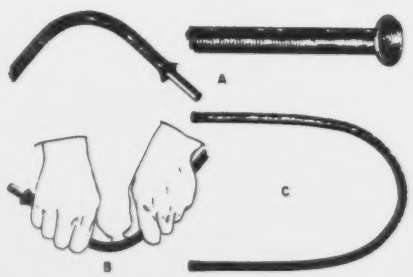


Fig 2-16. Bending tubing with spring type tube benders.

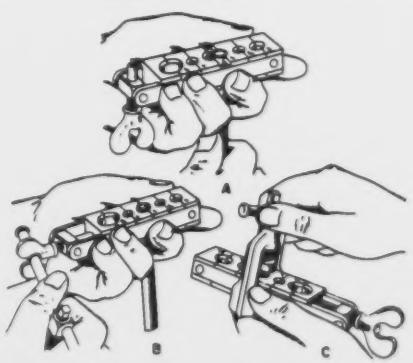


Fig 2-17. Flaring metallic tubing.

Tap and die sets (fig 2-18) are not found in every shop, but they can make your work a lot easier. Basically, these sets will cut threads in a bolt hole or on the bolt itself. The taps are used for threading a hole while the dies are used for cutting threads on a bolt. These sets are nice to have when a part has been cross-threaded because that will correct the threads. The sets come in two sizes, national coarse (NC) and national fine (NF). For example, a 5/8-inch NC bolt will have 11 threads per inch while the same bolt with NF will have 18 threadsper inch. This difference is the difference fine and coarse threaded bolts.

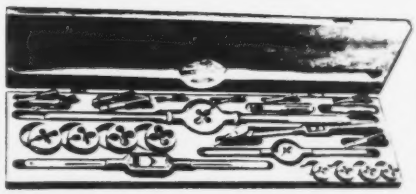


Fig 2-18. Bolt and screw threading set with round adjustable split dies, diestocks, taps, tap between wrenches, and screwdrivers.

Another useful piece of shop equipment is the vise (fig 2-19). The vise is designed to relieved you of the awkwardness of holding a piece of metal and filing and drilling it. The vise is secured to the bench and opens and closes using a sliding tee type handle. When using the vise, remember it will scar the surface the surface of the metal unless proper precautions are taken.

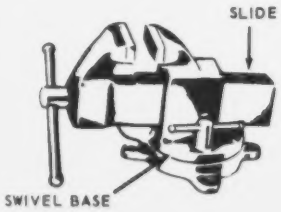


Fig 2-19. Vise.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The lever operated grease gun will hold approximately_____of grease.

   a. one pound
   b. one-half pound
   c. one quart
   d. one gallon

2. When using the bench grinder, you should wear proper_____protection.

   a. hand
   b. eye
   c. foot
   d. elbow

3. Besides filling tires and powering lubricators, the air compressor can be used to power air for the

   a. air conditioner.
   b. cleaning of equipment.
   c. portable tools for batteries.
   d. water fountain.

4. The tube cutter can be used for cutting metal for fuel lines or hydraulic lines as long as the metal is

   a. hard and firm.
   b. long and straight.
   c. soft.
   d. heated.

5. Tap and die sets usually come in two sizes: national coarse and national

   a. fine.
   b. medium.
   c. special.
   d. common.

Work unit 2-8. FASTENING COMPONENTS AND PROCEDURES

IDENTIFY PROPER BOLT GRIP.

IDENTIFY ONE TYPE OF BOLT.

IDENTIFY ONE PROPER SIZE OF MACHINE NUTS.

IDENTIFY PROPER FIT OF THREADS.

This work unit will discuss a variety of fastening devices and procedures so that you will be able to identify, select, and use the proper fastener on specific jobs. Your knowledge of these fasteners will enable you to perform assembly and disassembly work accurately and safely with proper tools. Fastener are designed for one purpose--to attach components together securely. Let's examine the distinctions between the various kinds.

When installing bolts, whenever possible, install it with the head up. This way if the nut has been improperly secured or is shaken loose by vibration and falls off, the bolt will remain within the part and continue to retain its holding capability although the nut is missing.

Be certain that the grip length of the bolt is correct (fig 2-20). The grip length is the length of the unthreaded portion of the bolt shank. Generally speaking, the grip length should equal the thickness of the material which is being bolted together. Not more than one thread should bear on the material, and the threaded portion of the shank should be showing through the nut (fig 2-20A). In figure 2-20B no threads from the bolt shank show through the nut's extremity and too many threads are bearing on the material. In figure 2-20C the nut cannot be threaded far enough to apply pressure on the materials.

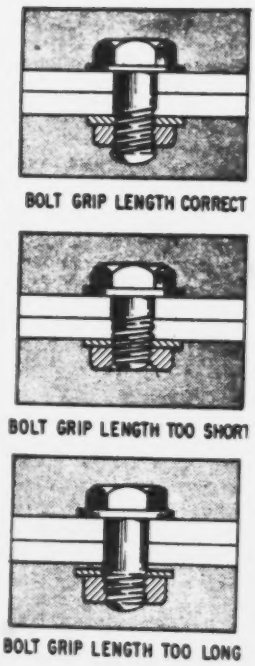


Fig 2-20. Correct and incorrect grip lengths.

The three main types of bolts that you will work with are shown in figure 2-21 . The carriage bolt has a round head with a square area on the shank. This bolt fits a square hole and is immobile in this position as you tighten the nut. The round cap on the end is used mainly where a surface is rubbed or a source of friction could develop. Machine bolts will be used most often. These bolts generally have a hex head although occasionally a square head is found. The thread on both the carriage and machine bolt can vary widely from the illustration. The hex head on the machine bolt allows the head and the nut to be tightened at the same time. The stove bolt has a head that fits a flat tip screwdriver as it is slotted. The head may be believed to fit in a countersunk hole or have a cap head. The stove bolt is generally a lightweight bolt used for lighter applications. Rarely will you use one that is larger than 3/8 inch.

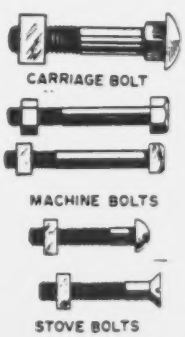


Fig 2-21. Bolts.

Machine screws (fig 2-22) is a general term used to designate the small screws that are used in tapped holes for the assembly of metal parts. Machine that have been tapped with matching threads.

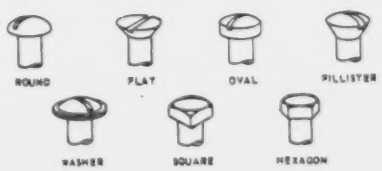


Fig 2-22. Machine screw.

Machine screws are manufactured in various lengths, diameters, pitches (threads per inch), materials, heads, finishes and thread fits.

Diameter and pitch seem to be irrelevent but let's examine this further (See Table 2-1.) A screw may be 1/4 inch or be labeled 8-32. Are these the same since 8/32 is 1/4 when divided? No, 8-32 is a measurement that identifies the screw gage as being number 8 and 32 is the threads per inch. Look at Table 2-1. 8-32 can be identified as a size 8 national coarse screw. Farther down the table is 1/4 inch, notice that by the decimal equivalent it is nearly twice as large. Also notice that instead of being coarse, now it would near the category of Extra Fine.

These fits are important also, because there are actually four classes of fits for threads. Class I is a loose fit, Class II is a free fit, Class III is a medium fit, and Class IV is close fit. The threads sized as shown in Table 2-1 are National Coarse, National Fine, and Extra Fine. Let's look a little deeper at the classes of fit.

Table 2-1. Screws Threads per inch

No.	Inch	Decimal	NC	NF	EF
0	----	.0600	--	80	---
1	----	.0730	64	72	---
2	----	.0860	56	64	---
3	----	.0990	48	56	---
4	----	.1120	40	48	---
5	----	.1250	40	44	---
6	----	.1380	32	40	---
8	----	.1640	32	36	---
10	----	.1900	24	32	40
12	----	.2160	24	28	---
---	1/4	.2500	20	28	36
---	5/16	.3125	18	24	32
---	3/8	.3750	16	24	32
---	7/16	.4375	14	20	28
---	1/2	.5000	13	20	28
---	9/16	.5625	12	18	24
---	5/8	.6250	11	18	24
---	3/4	.7500	10	16	20
---	7/8	.8750	9	14	20
---	1	1.0000	8	14	20

The loose fit is for threaded parts that can but put together quickly and easily even when the threads are slightly bruised or dirty, and when a considerable amount of shake or looseness is not objectionable. The free fit is for threaded parts that are to be put together nearly or entirely with the fingers and a little shake or looseness is not objectionable. This includes most of the screw thread work The medium fit is for the higher grade of threaded parts where the fit is somewhat closer. The close fit is for the finest threaded work where very little shake or looseness is desirable and where a screwdriver or wrench may be necessary to put the parts together. The manufacture of threaded parts belonging to this class requires the use of fine tools and gages. This fit should, therefore, be used only when requirements are exacting or where special conditions require screws having a fine, snug fit.

Set screws (fig 2-23) are used to secure small pulleys, gears, and cams to shafts and to provide positive adjustment of machine parts. Allen wrenches fit the set screws with the opening that matches on the setscrews. These types of set screws are used on moving parts because they do not protrude above the surface. They are threaded from point to head. Common set screws may have a square head and they have threads from the point to the shoulder of the head.

Besides the square and hex nuts, there are various other types of nuts with different purposes (fig 2-24). A jam nut is about half as tall as the hex nut and is used above a standard hex nut to jam or lock in into place.

Castellated nuts are slotted so that a safety wire may be pushed through the slots and into a matching hole in the bolt. This provides a positive method of preventing the nut from working loose.

Fig 2-23. Setscrews.

Wing nuts are used when the desired tightness can be attained with the fingers.

Fig 2-24. Common kinds of nuts.

Cap nuts are used when the appearance is an important consideration. It has a limit as to how much threaded portion of bolt that it will take. Thumb nuts have a knurled surface so that they can be turned by hand for quick assembly and disassembly.

Elastic stop nuts are used where it is imperative that the nut not come loose. These nuts have a fiber, plastic, rubber, or composition washer built into them.

Flat Washers (fig 2-25) are used to back up bolt heads and nuts, and to provide larger bearing surface es. They prevent damage to the surface of metal parts.

Fig 2-25. Washers.

Split lock washers are used under nuts to prevent loosening by vibration. The ends of these hardened washers dig into the metal of the nut and the material to prevent slippage.

Cotter pins (fig 2-26) are used to secure screws, nuts, bolts, and pins. They are also used as stops or holders on ends of rods.

Square keys and woodcuff keys (fig 2-25) are used to prevent hand wheel, gears, cams, and pulleys form turning on a shaft. These keys are strong enough to carry heavy loads if they are fitted and seated properly.

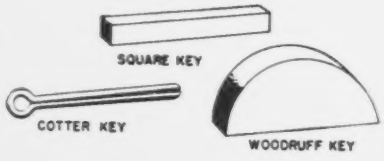


Fig 2-26. Pin and keys.

Rivets (fig 2-27) are used when the use of any other type of fastener is not practical. There are various types of rivets with heads designed for special purposes.

The rivet is placed in a predrilled hole of the correct diameter; the end with the head is flush to the material being joined. The end coming through is flattened with a hammer while being held firmly in place. Rivets generally are made from aluminum or a soft metal alloy.

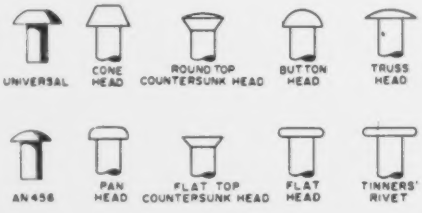
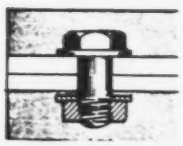
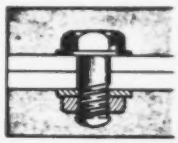


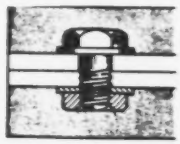
Fig 2-27. Some common types of rivets.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. In the illustration shown below, identify the illustration that shows the proper bolt grip. (_____)


a.


b.


c.

2. The term used to designate the small screws that are used in tapped holes for the assembly of metal parts is_____screws.

   a. carriage
   b. fillister
   c. machine
   d. stove

3. The decimal equivalent for a 2-64 screw is .0860 which identifies the screw as being

   a. 1/8 inch.
   b. coarse.
   c. fine.
   d. extra-fine.

4. When the desired tightness of a nut can be achieved with your fingers, a_____ nut can be used.

   a. cap
   b. square
   c. stop
   d. wing

Answers to Study Unit #2 Exercises

Work Unit 2-1.

1. d.
2. a.
3. d.

Work Unit 2-2.

1. a.
2. a.
3. d.
4. b.

Work Unit 2-3.

1. b.
2. c.
3. d.

Work Unit 2-4.

1. a.
2. c.

Work Unit 2-5.

1. a.
2. b.
3. c.
4. d.
5. c.

Work Unit 2-6.

1. b.
2. d.
3. d.
4. b.
5. a.

Work Unit 2-7.

1. a.
2. b.
3. b.
4. c.
5. a.

Work Unit 2-8.

1. b.
2. c.
3. c.
4. d.

STUDY UNIT 3

SHOP SAFETY PROCEDURES

STUDY UNIT OBJECTIVE: WITHOUT THE AID OF REFERENCES, YOU WILL IDENTIFY SHOP SAFETY PROCEDURES. YOU WILL ALSO IDENTIFY THE FIRE PREVENTION TECHNIQUES AS WELL AS THE FIREFIGHTING PRINCIPLES FOR A TYPICAL SHOP.

Shop safety procedures are an important part of every shop. These procedures are set up to protect everyone employed at the shop. Poor procedures often result in lost time from injuries and affect the efficiency of the shop. These results often put the burden of maintenance on the mechanic who is professional and follows the shop's safety procedures.

Work Unit 3-1. FIRE PREVENTION

IDENTIFY THE IMPORTANCE OF FIRE PREVENTION.

IDENTIFY THE MAJOR CAUSE OF FIRES.

The major goal of fire prevention is to eliminate injuries and prevent the loss of life and the loss of property. However, you must be aware of the ingredient for fires before you can prevent them.

Before a fire can start, three things are necessary; fuel (something that burns) heat, and oxygen. Take away one of these three items and the fire will go out or get smaller. Fire extinguishers work on this principle.

Within the shop, there are various ways that a fire can develop. For instance fire could develop in a trash can as a result of a ignited cigarette. The fire could then be spread by flammable material nearly. For this very reason, the service area should be a "NO SMOKING" area.

As you observe the shop, you will notice many fire prevention principles in effect.

Some of these principles are:

Fire extinguishers are wall-mounted at chest height and not stacked around or lying on the floor.

Trash receptacles with metal lids are emptied daily.

The shop area is a "NO SMOKING" area and has this warning presented on signs or painted on the deck.

Paints and flammables are not stored on the benches in the shop.

These materials are stored in an area that is labeled the "PAINT LOCKER."

Areas that are approved for smoking elsewhere in the shop have a red border painted on the floor and signs are labeled on the walls that read "SMOKING AREA." Butt kits or ashtrays are provided.

Fire evacuation plans are posted to display the methods of evacuation and the locations of fire extinguishers. This plan should state what you should do in case of a fire and who to call.

Rags are stored in metal containers and not left on the benches for someone else to cleanup.

Fire stations are assigned to individuals who know their locations and what their mission is in case of fire. Fire stations are located in such a manner as to maximize their effectiveness while not putting the individual in a life threatening position.

Power tools and electrically powered devices are provided with a ground fault indicator (GFI), which resembles a prong on the plug. The GFI channels a charge of electricity back into the electrical outlet to dissipate the charge into the ground. This stops accidental arcing or sparking into a flammable material.

As you can see by the above principles, housekeeping is a very important part of fire prevention. Keeping everything in its place and keeping the shop clean not only prevents fires, but also presents a professional appearance.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The major goal of fire prevention is to stop injuries, loss of life, and loss of

   a. property.
   b. tools.
   c. maintenance time.
   d. records.

2. Before a fire can start, three things are necessary. These three things are _____ , _____ , and

   a. action, fuel, and oxygen.
   b. debris, fuel, and heat.
   c. oxygen, fuel, and heat.
   d. debris, fuel, and oxygen.

3. The major cause of fires is careless

   a. mechanics.
   b. smoking.
   c. operations.
   d. wiring.

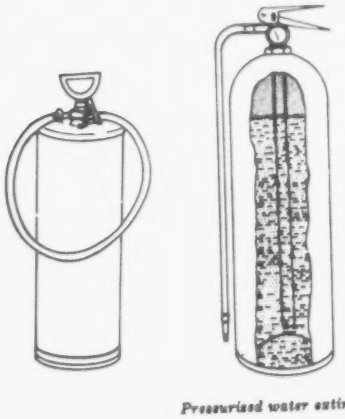
Work Unit 3-2. FIREFIGHTING PROCEDURES

IDENTIFY ONE PROCEDURE USED IN FIRE DRILLS.

IDENTIFY TWO TYPES OF FIRE EXTINGUISHERS.

Firefighting procedures are provided within every shop through training and fire drills. Fire drills are important because you practice what needs to be done in case of a fire. You already are aware of the fire evacuation plan which identifies the exits. So in case of a fire what you should do is run to the exit and get out of the area, right? Wrong. The fire drill begins with some sort of alarm, perhaps a bell, shout, or a siren. When you hear this, you should shut off all lights, unplug, all electrical devices, close the windows and the doors, and report to your fire station.

Okay, you have a fire station, what now? There are basically four types of fires. Class A fires are brush fires, wood fires, or trash fires. Class B fires are gasoline, solvent, or paint fires. Class C fires are electrical fires, such as are caused by electrically motors or transformers. Class D fires are burnable metal or chemical fires such as steel wool, magnesium, or sodium. Your extinguisher will probably by either water for class A fire (fig 3-1) or the CO^2 (fig 3-2) which can be used on class B or C fires.



Pressurized water extinguisher.

Fig 3-1. Water Extinguisher.

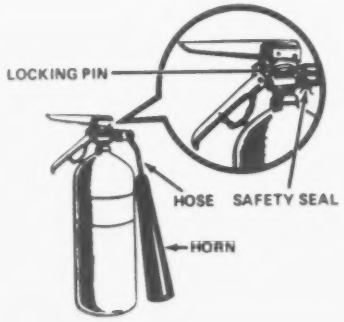


Fig 3-2. CO^2 Extinguisher

The water extinguisher may operate under pressure or have a plunger type pump mounted on it. The CO^2 extinguisher will be operated by a handle being depressed into a gas cylinder causing it to puncture. This puncture allows for pressurization of the cylinder. CO^2, by nature, has a cooling effect on the fire, thereby removing heat from the fire. The cooling effect is a fine mist of dry vice crystals.

When you have to use the extinguisher, always aim at the base of the fire because this is where it will do the most good. If the fire is to big for just one extinguisher, your mission here is to try to contain the spread of the fire and protect equipment located nearby.

EXERCISE: Answer the following questions and check your responses against those at the end of this study unit.

1. When you hear the alarm for fire, you should report to your fire station after you have shut off all lights, electrical devices and have

   a. saved your tools.
   b. emptied the garbage.
   c. shut doors and windows.
   d. called the military police.

2. If a fire develops in the wood pile near the shop, you should put the fire out with a class_____fire extinguisher.

   a. A.
   b. B.
   c. C.
   d. D.

3. If you have an electrical fire, you should use a_____fire extinguisher.

   a. water
   b. CO^2
   c. dry chemical
   d. wheeled

Work Unit 3-3. SHOP SAFETY REGULATIONS

IDENTIFY THE PURPOSE OF MISHAP PREVENTION.

IDENTIFY THREE SHOP SAFETY REGULATIONS.

In the shop there are procedures for safety as well as fire prevention. The purpose of safety regulations is to prevent mishaps from occurring. A mishap is an interruption in an intended course of action resulting in injury or death to a Marine or damage to government property not incidental to a combat zone or hostility. If you drop a hammer on your toe, this is a mishap; however, if someone else strikes you with a hammer to do damage on your person, that is not a mishap. Mishaps are accidental in nature and not done deliberately. There are three things that can contribute to a mishap. These are the Marine, what he is working on, and the location where he is working.

The Marine may be using a wrench to remove a tight nut. If it slips off the nut he suffers injury to his hand. The nut is the work and any factor such as tight quarters or lighting are the location. Mishaps cost money not only because of lost time due to injury, but because of lost maintenance time on the work project.

Most shops will have boards stating various shop regulations in locations around the work areas. Let's look at a few of these regulations:

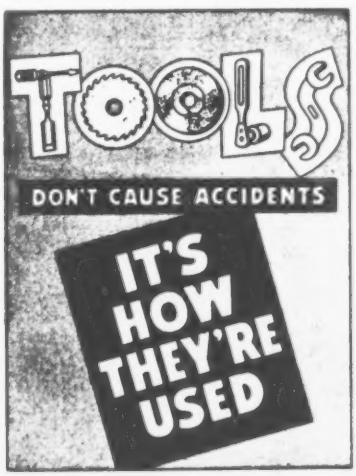


Fig 3-3. Safety Poster.

No horseplay or skylarking in the shop (fig 3-3). This is important. If the shop is run like a professional shop, the work will be done more effectively and efficiently. Horseplay is like throwing a hammer at someone as a joke. The joke backfires when the hammer hits an unsuspecting bystander causing an injury. Horseplay has no place in the shop.

No smoking in the shop. This is both fire prevention and a safety regulation.

Pickup your tools and store them properly. If someone steps on a screwdriver, this could cause a falling injury. Mechanics that are assisting you could trip and fall, not only injuring them but you also.

Cleanup oil spills. Oil spills that are not cleaned up quickly or covered with an absorbent material could cause slipping injuries; therefore, clean up the oil as soon as you can.

Use the exhaust pickup. If your shop has an exhaust ventilation system, slip the adjustable hose over the equipment's exhaust stack to channel off the carbon monoxide. Generally, equipment or vehicles are not run inside a building; however, there may be times when this will be necessary. The fumes could cause sickness or even death through asphixiation.

Know the location of the first aid kit. If an injury occurs, you may have to act fast to treat the wound.

When guiding a vehicle onto a lube rack, do not stand in front of it. Before starting to lubricate a vehicle, make sure the ignition is off, the gearshift is in neutral, the brake is set, and the wheels are blocked. When servicing a vehicle, stand so that the body is clear in case the vehicle starts to roll. Unless it is in a pit, work under equipment only when it is properly blocked. Remove clothing without delay if it has been soaked in gasoline or oil. Wash with soap and water and put on clean clothing. Do not put gasoline-soaked rags in pockets.

Know the means of calling the closest firefighting equipment. Give the alarm immediately in case of fire and know how to use available firefighting equipment. If a fire starts in the vicinity of a vehicle a fuel nozzle is in the tank. LEAVE THE NOZZLE IN THE TANK, stop the pump, warn the occupants of the vehicle to get out, then smother the flames with a fire extinguisher.

When using tools, inspect them and all similar equipment before use. Replace splintered, broken, rough, or loose tool handles. Keep the cutting edges sharp and use the tool only for its designed purpose.

Wear safe clothing. Do not wear thin-soled shoes or loose or ragged clothing. Keeping coats buttoned and shoestrings tied. Do not wear oversized trousers.

When lifting and carrying heavy objects, provide enough men to do the job. Keep the arms and back as straight as possible. Bend the knees and lift with the leg muscles, lifting with a smooth even motion. When carrying, keep the load close to the body.

Wear approved safety goggles or eyeshields when grinding, chipping, cutting, pouring, or handling hot meals or acids.

Do not talk to anyone while operating machines. Pay attention to the job at hand.

When using a grinding wheel, observe the following rules:

Use goggles.

When starting a grinding wheel, stand to one side of the wheel for a full minute after turning it on.

Use the tool rest, and keep it close to the wheel.

Do not grind on the side of the wheel.

Do not crowd a grinding wheel. Cold wheels are particularly dangerous. Pressure should be applied gradually and the wheel allowed to warm up.

When working in the Battery Shop, observe the following rules:

Exercise care not to short-circuit battery terminals when using tools around batteries.

Avoid striking metallic surfaces or causing sparks.

Use only tools with insulated handles when removing or replacing batteries.

Do not make repairs to the battery while the circuit is energized.

Make certain that the charging current is off before the batteries are connected to, or disconnected from, the charging line.

Use premixed electrolyte if available. However, if mixing is required, NEVER POUR WATER INTO ACID. The acid must be poured slowly into the water, using a glass or earthenware container.

Guard the eyes and the skin from splashing acid.

Your shop will have more regulations than those that were just mentioned. Study your shops regulations and make any recommendations that you think are necessary to the Maintenance Chief. Remember, the only bad idea is the one that you keep to yourself. Take an active part in the safety program at the shop in which you work.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. An interruption in an intended course of action that causes injury or death to a Marine without being involved in hostile actions is a(n)

   a. accident.
   b. mishap.
   c. bummer.
   d. problem.

2. Explain why horseplay is bad for the shop._____

   _____

3. Explain how to use the exhaust pickup._____

   _____

4. Explain what rules are important when using the bench grinder._____

   _____

5. When you are working in the battery shop, you should mix acid and water by

   a. using metal buckets.
   b. pouring water into acid.
   c. pouring acid into water.
   d. shaking rapidly in a container.

Work Unit 3-4. SHOP SAFETY PROGRAMS

IDENTIFY THREE FORMS OF PERSONAL PROTECTION.

As a mechanic, you will come into contact with work that could affect you eyes and ears. Obviously, most injuries to your eyes and ears will have a lasting effect because they will be permanent.

Exposure to potentially harmful noise is one of the most significant occupational health hazardsfaced by Marines. Repeated, unprotected exposure to loud noise can cause a permanent hearing lose. Your hearing cannot be replaced or repaired, although it may be amplified through the use of a hearing aid in severe cases.

Your shop should have all sources that could be potentialy damaging to your hearing labeled with an appropriate warning. These areas should be anywhere where the noise exceeds the safe limit of 85 dbA (db means decibels, a unit of measurement of sound; A is a scale that sound is measured on). There is a requirement that each shop be tested at least annually to identify the current levels of noise. What could be hazardous in a shop? Two items come to mind immediately. One is the bench grinder and the other is compressed air being used for cleaning. There are also running engines, aircraft, and power tools. Even a tool gets marked if it is hazardous to your hearing.

You are to protect your hearing by wearing ear plugs or muffs. The ear plugs will provide the best protection. See your corpsman to get the right size as he will fit you with your proper size.

Hearing protection works only if you use it. It may seem to be very uncomfortable at first or it may seem to be a hassle. However, remember, you will not be in the Marine Corps forever, and that's how long your hearing loss will be. It will not end when you get out. It will continue and it will probably get worse.

Throughout this course you have learned how important your hands are to you as a mechanic. You need to see to use your hands most of the time. If you lose your eyesight, you will have to use your hands to see the work all of the time. Not a very pleasant thought. All you have to remember is to wear your eye protection. Eye protection is available at every shop, whether it is goggles or a full face shield. Keep in mind that the grinder is a site of frequent eye injuries. Even if you only have a small area to grind do not forget to use the eye protection. This is all it takes for a serious eye injury to occur.

If you are working around an area where heavy objects are being moved, you should wear safety shoes or toe caps. Safety shoes have a steel toe in them that will deflect a falling object, avoiding injury.

Safety shoes have to be ordered for you in your shoe size. As a mechanic, you need some sort of foot protection. In some shops, toe caps are available. These caps fit over the toe of your shoe and serve to deflect falling objects. Although the foot protection will deflect some falling objects , heavy objects may still cause you injury , but perhaps not as serious.

There also other forms of safety equipment available. These may be aprons, rubber gloves, battery shop coveralls, gloves, and hard hats to protect your head form falling objects. Try to remember all of the safety equipment that is available to you.

EXERCISE: Answer the following questions and check your responses against those listed at the end of this study unit.

1. The greatest danger connected with hearing loss is

   a. you may not hear trouble-shooting sounds.
   b. the loss is permanent.
   c. that ear plugs may not fit in your ears.
   d. you will have troubles with repairs to your hearing.

2. In the Marine Corps, hazardous noise is measured as being greater than _____ decibels.

   a. 85
   b. 90
   c. 965
   d. 100

3. Eye injuries in the shop are most likely to occur around the

   a. welder.
   b. battery room.
   c. tool room.
   d. grinder.

4. The best foot protection for mechanics is provided by the use of

   a. safety socks.
   b. benches.
   c. safety caps.
   d. safety shoes.

Answers to Study Unit #3 Exercises.

Work Unit 3-1.

1. a.

2. c.

3. b.

Work Unit 3-2.

1. c.

2. a.

3. b.

Work Unit 3-3.

1. b.

2. It can cause injury, loss of time, and a loss of the effective maintenance effort.

3. The exhaust pickup is an adjustable hose that fits the exhaust pipe. With the hose in place, dangerous carbon monoxide is ventilated from the building.

4. Use goggles; let the grinder warm up for one minute; use the tool rest; do not grind on the side of the wheel; do not crowd a grinding wheel, instead use little pressure to let the wheel warm up.

5. c.

Work Unit 3-5.

1. b.

2. a.

3. d.

4. d.

BASIC SHOP FUNDAMENTALS FOR THE MECHANIC

Review Lesson

Instructions: This lesson is designed to aid you in preparing for your final examination. You should try to complete this lesson without the aid of reference materials, but if you do not know an answer, look it up and remember what it is. The enclosed answer sheet must be filled out according to the instructions on its reverse side and mailed to MCI using the envelope provided. The questions you miss will be listed with references on a feedback sheet (MCI-R69) which will be mailed to your commanding officer with your final examination. You should study the reference material for the questions you missed before taking the final examination.

A. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

1. When you report to a shop, you will have access to or be issued a(n)

   a. tool box.
   b. general purpose repair kit.
   c. general mechanics tool kit.
   d. intermediate tool kit.

2. The General Mechanics Tool Kit is secured by the use of a padlock with two keys. One key is kept by the mechanic, and the other is kept in a sealed envelope and stored

   a. with a friend.
   b. in your wall locker.
   c. in the company safe.
   d. in a secret place.

3. The most important tools of the mechanic are his

   a. screwdrivers.
   b. wrenches.
   c. hammers.
   d. hands.

4. The problem with dirty tools is that they

   a. look bad.
   b. slip from your hands.
   c. start to smell.
   d. are hard to wash.

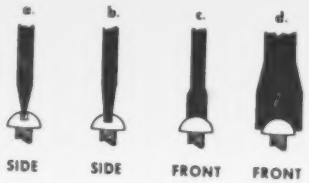
5. The three main parts of the screwdriver are the blade, handle, and

   a. shank.
   b. end.
   c. side.
   d. width.

6. The main types of screwdrivers found in the General Mechanics Tool Kit are the flat tip and the

   a. Reed and Prince Cross Point.
   b. Phillips cross tip.
   c. Phillips cross point.
   d. Meseck cross tip.

7. Which of the following illustrations shows the proper fit of a screwdriver?



8. If the flat tip screwdriver has a chipped blade, you should

a. retemper it.
b. grind the shank.
c. grind the ends and shank.
d. grind the sides and square the end.

9. The two types of hammers found in the General Mechanics Tool Kit are the ballpeen and the

a. claw.
b. sledge.
c. plastic faced.
d. stillson.

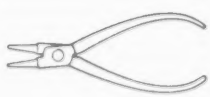
10. Which of the statements below describes an unserviceable hammer?

a. Small chips on the face of the ball peen
b. Sides of ball peen scratched
c. Face of hammer is flat
d. Head of hammer has large chips and is cracked

11. Which of the illustrations below identifies battery terminal pliers?

a.
b.
c.
d.

12. Which of the following illustrations identifies cutting pliers?

a.
b.
c.
d. 

13 The pliers which are designed to cut objects flush are the_____pliers.

a. long nose
b. diagonal
c. needle nose
d. brake

14. The wrench is a basic tool that exerts a_____force.

a. circular
b. twisting
c. maximum
d. combined

15. The adjustable end wrench is used when you are

a. working with tight or rusty nuts and bolts.
b. late getting a job done.
c. working with odd size nuts or bolts.
d. fitting pipes together.

B. Matching: Column 1 (items 16-20) contains a list of socket wrench tools. Column 2 (a through e) contains illustrations of the socket wrench tools contained in column 1. Match the socket wrench tool in column 1 with its illustration in column 2. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

Column 1 Socket Wrench Tool	Column 2 Illustration
___ 16. Hinged handle	a.
___ 17. Universal	b.
___ 18. Deep well	c.
___ 19. Crowfeet	d.
___ 20. Sliding T-Bar	e.

C. Multiple Choice: Select the ONE answer the BEST complete the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

21. The pipe wrench should not be used on

a. black pipe.
b. brass.
c. galvanized metal pipe.
d. steel pipe.

22. The General Mechanics Tool Kit contains two types of chisels, the

a. hot and cold.
b. cold and 1-pound.
c. cape and round.
d. cold and cape.

23. The chisel is designed to_____while the punch is designed to_____.

a. chisel, punch.
b. cut, perforate.
c. chips, cut.
d. cut, etch.

24. The heads on the chisel and punch will become worn after frequent usage which a condition known as

a. worming.
b. dressing.
c. mushrooming.
d. worn.

25. The size of the chisel is determined by the

a. shape.
b. length.
c. edge.
d. circumference.

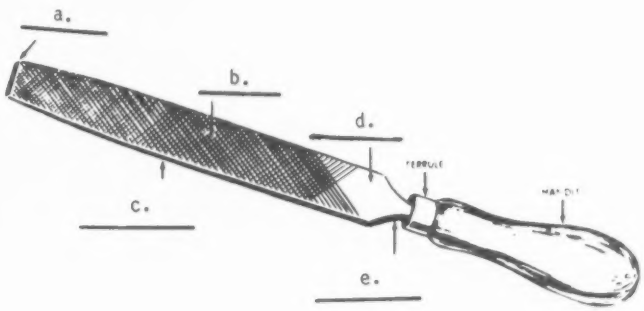
26. The three types of files in the General Mechanics Tool Kit are classified by their

a. cut.
b. shape.
c. fineness.
d. length.

D. Matching: Column 1 contains a list of five parts of a file. Column 2 contains an illustration depicting the five parts of a file. Match the part of the file to its correct location in the illustration. After the corresponding number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

Column 1	Column 2
Parts of a file	Illustration
____ 27. Heel	
____ 28. Tang	
____ 29. Face	
____ 30. Edge	
____ 31. Point	

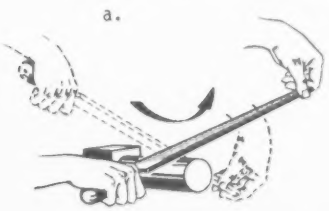


E. Multiple Choice: Select the ONE answer that BEST completes the statement or answers the question. After the corresponding number on the answer sheet, blacken the appropriate circle.

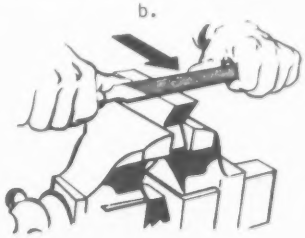
Value: 1 point each

32. Which of the illustrations below depicts drawfiling?

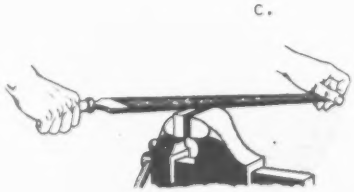
a.



b.



c.



33. The measuring tool within the General Mechanics Tool Kit that is used to measure circumference is the

a. feeler gage.
b. thickness gage.
c. tape measure
d. 6-inch rule.

34. The thickness of feeler gages may be used to measure

a. bolts.
b. large slots.
c. circumference.
d. machine clearance.

35. The tool that is used to increase the size of the terminal opening is the

a. battery plier.
b. terminal puller.
c. terminal clamp spreader.
d. wire brush.

36. Three battery tools that are found in the General Mechanics Tool Kit are the terminal clamp spreader, terminal puller, and the

a. battery terminal brush.
b. battery pliers.
c. terminal pliers.
d. vice grips.

37. The eleven "L" shaped tools in the Tool Kit are the

a. sockethead screws.
b. M-76 wrenches.
c. screw sets.
d. sockets.

38. The small tool kit that contains screwdrivers, pliers and nine open end wrenches is the

a. electronic ignition kit.
b. automotive electrical kit.
c. electrical repair kit.
d. stillson tool kit.

39. The tool in the General Mechanics Tool Kit used to provide light in a dark area is the

a. electrical circuit tester.
b. flashlight.
c. drop cord.
d. flood light.

40. Besides its size, the use of the putty knife can be determined by the

a. bevel of the edge.
b. thickness of the blade.
c. spacing of the teeth.
d. shape of the handle.

41. The SL-3 provides a components list for tool kit

a. inventory.
b. replacement.
c. stock numbers.
d. all of the above.

42. The Commanding Officer provides his policy and guidance to the_____for proper operation of the shop.

a. mechanic
b. shop chief
c. maintenance chief
d. maintenance officer

43. The direction of the maintenance effort within the shop is set by the

a. Maintenance Officer.
b. Commanding Officer.
c. Maintenance Chief.
d. Quality Control Inspector.

44. The most important tool within the shop is the

a. ballpeen hammer.
b. screwdriver.
c. mechanic.
d. pry bar.

45. First and second echelon maintenance falls into the category of_____maintenance.

a. organizational
b. depot
c. battalion
d. intermediate

46. Depot maintenance consists of____echelon maintenance only.

a. 1st
b. 3rd
c. 4th
d. 5th

47. Third and fourth echelon maintenance fall into the category of_____maintenance

a. depot
b. battalion
c. intermediate
d. organizational

48. When a defect in equipment is found during a limited technical inspection, it is either repaired on the spot or

a. the next day.
b. an ERO is opened.
c. another LTI is done.
d. forgotten.

49. The mechanic fills out the ERO completely and signs it when the work is

a. started.
b. difficult.
c. completed.
d. changed.

50. The white copy of the completed ERO is filed

a. in the record jacket.
b. in the supply area.
c. by the Maintenance Officer.
d. in the technical manual.

51. The way the shop functions is the end result of

a. maintenance planning.
b. highly trained technicians.
c. a well stocked tool room.
d. proper tool usage.

52. Quality control ensures that the job is done

a. more quickly.
b. professionally.
c. correctly.
d. all of the above.

53. The publication that will show the parts needed for repairs and their stock numbers is the

a. SL-3.
b. SL-4.
c. LO.
d. SL-8.

54. The publication that shows details of assembly and disassembly along with explanations of procedures is the

a. SL-3.
b. SL-4.
c. TM.
d. LO.

55. The publication that deals with a new change to the structure of equipment and how and where to change it is the

a. SL-3.
b. SL-4.
c. TM.
d. MI.

56. The publication that is a components list is the

a. SL-3.
b. SL-4.
c. MI.
d. TM.

57. The tool room has four main functions. These functions are to:

a. issue and receive tools; clean and display tools; repair or replace tools; and provide secure storage.

b. issue and receive tools; repair or replaces tools; provide secure storage; and service and maintain tools.

c. assist the mechanic; provide secure storage for tools; issue and receive tools; and display tools.

d. display special tool kits; assist the mechanic; issue and maintain tools; and repair or replace tools.

58. Supply has a pre-expendables bin which may contain

a. high value parts.
b. batteries and fuel tanks.
c. seldomly used parts.
d. low value, high usage parts.

59. The area within the shop that has an emergency eyewash and shower is the

a. head.
b. administrative section.
c. lubrication area.
d. battery shop.

60. The service bay or work area is generally the area set aside for

a. corrective maintenance.
b. tool storage.
c. charging batteries.
d. test driving equipment.

61. Access to the underside of vehicles and equipment is made easier by the use of the

a. head.
b. lub rack or pit.
c. driveway.
d. chain hoists.

62. The lever operated grease gun will hold approximately_____of grease.

a. one pound
b. one half pound
c. one quart
d. one gallon

63. When using the bench grinder, you should wear proper_____protection.

a. hand
b. eye
c. foot
d. elbow

64. Besides filling tires and powering lubricators, the air compressor can be used to power air for

a. volleyballs.
b. the cleaning of equipment.
c. portable tools for batteries.
d. the water fountain.

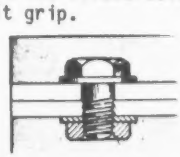
65. The tube cutter can be used for cutting metal for fuel lines or hydraulic lines as long as the metal is

a. soft.
b. heated.
c. hard and firm.
d. long and straight.

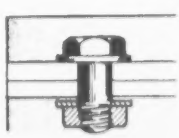
66. Tap and die sets come in two sizes; national coarse and national

a. fine.
b. medium.
c. special.
d. extra fine.

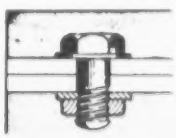
67. From the illustrations shown below, identify the illustration that shows the proper bolt grip.



a.



b.



c.

68. The term used to designate the small screws that are used in tapped holes for the assembly of metal parts is_____screws.

a. fillister
b. carriage
c. stove
d. machine

69. When the desired tightness of a nut can be achieved with your fingers, a_____nut can be used.

a. cap
b. square
c. stop
d. wing

70. The decimal equivalent for a 2-64 screw is .0860 which identifies the screw as being (Use the chart provided.)

a. coarse.
b. 1/8 inch.
c. extra-fine.
d. fine.

Diameter		Threads Per Inch			
No.	Inch	Decimal Equivalent	NC	NF	EF
0	----	.0600	---	80	---
1	----	.0730	64	72	---
2	----	.0860	56	64	---
3	----	.0990	48	56	---
4	----	.1120	40	48	---
5	----	.1250	40	44	---
6	----	.1380	32	40	---
8	----	.1640	32	36	---
10	----	.1900	24	32	40
12	----	.2160	24	28	---

71. The major goal of fire prevention is to eliminate injuries, loss of life, and loss of

a. tools.
b. records.
c. property
d. maintenance.

72. Before a fire can start, fuel, oxygen, and _____are necessary.

a. initiating action
b. heat
c. air
d. explosion

73. Fire drills are important because they

a. are necessary.
b. provide practice for a real fire.
c. provide a break during the day.
d. help you to do a better job.

74. The fire extinguisher that you may use on wood or brush fires is a class_____ extinguisher.

a. A
b. B
c. C
d. D

75. An electrical fire should be extinguished with a_____fire extinguisher.

a. CO^2
b. water
c. dry chemical
d. all of the above

76. An interruption in an intended course of action that causes injury or death to a Marine not involved in hostile actions is a(n)

a. problem.
b. accident.
c. mishap.
d. occurrence.

77. When you are working in the battery shop, you should mix acid and water by

a. pouring water into acid.
b. pouring acid into water.
c. using a metal bucket.
d. shaking them rapidly in a container.

78. When you are working inside the shop on an operating vehicle, you should use the

a. accelerator thermostat.
b. evacuation hoses.
c. exhaust pickup.
d. air conditioner.

79. When you use the bench grinder, you should

a. grind on the side of the wheel.
b. use a cold grinding wheel.
c. remove the tool rest.
d. wear eye protection.

80. Three forms of personal protection are

a. ear plugs, nose plugs, and goggles.
b. ear plugs, goggles, and safety shoes.
c. goggles, nose plugs, and utilities.
d. goggles, ear plugs, and dark clothing.

Total Points: 80

* * *

☆U.S. GOVERNMENT PRINTING OFFICE: 1984 461 643 10057

TRE-1

STUDENT COURSE CONTENT ASSISTANCE REQUEST

DATE:

COURSE NUMBER COURSE TITLE

NAME RANK MOS

SOCIAL SECURITY NUMBER

1. Use this form for any questions you may have about the course. Write out your question and refer to the study unit, work unit, or study question with which you are having problems. Complete the self-addressed block on the reverse side. Before mailing, fold the form and staple it so that MCI's address is showing. Additional sheets may be attached to this side of the form.

MY QUESTION IS:

OUR ANSWER IS:

SIGNATURE (TITLE OR RANK)

STUDENT: Detach and retain this portion.

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 U.S.C. 522A)

1. AUTHORITY: Title 5, USC, Sec. 301. Use of your Social Security Number is authorized by Executive Order 9397 of 22 Nov 43.

2. PRINCIPAL PURPOSE: The Student Course Content Assistance Request is used to transmit information concerning student participation in MCI courses.

3. ROUTINE USE: This information is used by MCI personnel to research student inquiries. In some cases information contained therein is used to update correspondence courses and individual student records maintained by the Marine Corps Institute.

4. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION: Disclosure is voluntary. Failure to provide information may result in the provision of incomplete service to your inquiry. Failure to provide your Social Security Number will delay the processing of your assistance request.

INSTRUCTIONS TO STUDENT

1. Fold so that MCI address is outside
2. Insert course number in square marked "Course Number" below
3. Seal with scotch tape or one staple
4. Mail to MCI

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 12485 WASHINGTON D. C.

POSTAGE WILL BE PAID BY U.S. MARINE CORPS

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

UNITED STATES MARINE CORPS
MARINE CORPS INSTITUTE
P. O. BOX 1775
ARLINGTON, VA 22223

STUDENT REQUEST/INQUIRY
MCI - R14 K

DATE SENT: _____
DATE RECEIVED AT MCI: _____

COURSE NUMBER	COURSE TITLE

COMPLETE ALL PORTIONS OF SECTION 1

Section 1. Student Identification

Rank	Initials	Last Name	MOS

SSN	REPORTING UNIT CODE (RUC)

MILITARY ADDRESS

ZIP CODE

INSTRUCTIONS: Print or type name, rank, and address clearly. Include ZIP CODE. Only Class III Reservists may use civilian address.

Section 2. CHECK THE APPROPRIATE BOX AND FILL IN THE APPROPRIATE SPACES.

FOR REGULAR AND CLASS II RESERVE MARINES THIS FORM MUST BE SIGNED BY THE COMMANDING OFFICER OR HIS REPRESENTATIVE, i.e. TRAINING NCO.

1. ☐ EXTENSION - Please grant an extension. (Will not be granted if already on extension.)

2. ☐ NOTICE OF COURSE COMPLETION - Final Exam Sent On _____. (New exam will be sent if exam not received at MCI.)

3. ☐ REENROLLMENT - Student has course materials (See para. 4003 of Vol. I of MCI Catalog for information on reenrollment.)

4. ☐ OVERDUE FINAL EXAM - Last (Review) lesson sent on _____. Please send exam.

5. ☐ Please send new ANSWER SHEETS.

6. ☐ Please send missing course materials (Not included in course package.) Lessons____ Manual_____ Other_____

7. ☐ CHANGE - Rank_____ Name _____
Social Security Number ☐☐☐-☐☐-☐☐☐☐
RUC _____

8. ☐ OTHER (explain)_____

_____

Note: This form will not be returned by MCI. If request is valid, transaction will show on next UAR or on MCI-R1_ form.

_____
SIGNATURE-TITLE OR RANK
(MUST BE CO OR REPRESENTATIVE)

FOR MCI USE ONLY

1. D____
2. On SMF____ K____ L____
3. C____
4. L____
5. Q____
6. P____
7. E____
8. _____

_____

_____

DATE COMPLETED_____

ORIGINATOR CODE_____

STUDENT: Detach and retain this portion.

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UNITED STATES MARINE CORPS
MARINE CORPS INSTITUTE
P. O. BOX 1775
ARLINGTON, VA 22223

DETACH BEFORE MAILING